Electrical World and Engineer

THE CONSOLIDATION OF "THE ELECTRICAL WORLD" AND "ELECTRICAL ENGINEER."

VOL. XXXVIII. NEW YORK, SATURDAY, AUGUST 24, 1901. No. 8.

ELECTRICAL WORLD AND ENGINEER

(INCORPORATED.)

120 LIBERTY STREET, NEW YORK.

TELEPHONE CALL: 4044 CORTLANDT. CABLE ADDRESS: ELECTRICAL, NEW YORK.

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ELECTRICAL WORLD AND ENGINEER.

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Entered as second-class mail matter at the New York Post Office.

NEW YORK, SATURDAY, AUGUST 24, 1901.

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THE INSTITUTE CONVENTION.

We are glad to note that in spite of the unseasonable weather, and one might almost say, the unseasonable season, the American Institute of Electrical Engineers has been holding a good convention here and at Buffalo. The courtesies and hospitalities extended to the society and its foreign guests have been numerous and hearty, and we venture to think that our friends from Europe will take back with them pleasant memories of their trip and the exercises. Americans go to Europe in shoals. Few Europeans visit this country as tourists, and it will not be until there is more reciprocity of travel that a full mutual understanding between the Old World and the New can be established. Americans are always broadened in view by their trips abroad, but the benefits of a "sea change" are not a new phenomenon.

ELECTRIC TOWERS.

A few weeks ago we were indebted to Mr. Luther Stieringer, the consulting engineer of the Pan-American Exposition for a most interesting and instructive article on the illumination of Exposition grounds and other large open areas. The article was evidently read with much pleasure by our readers, and has been in demand; so that we are now glad to supplement it with another article from the same expert source, on electric towers. Mr. Stieringer not only traces their history and evolution, but explains how certain effects can be attained with others, presumably as good, should never be attempted. Few of the visitors who admire the entrancing spectacle at Buffalo stop to think of the experience and technique that lie back of the achievement. We regard Mr. Edison's comment one of the pithiest and most suggestive, namely, that all the fairyland of light that so delights the eye and satisfies the imagination is produced by "a hatful of filaments." It is the knowing how to use a mere hatful of filaments that has enabled Mr. Stieringer to stamp himself as pastmaster in the art of illumination.

RAPID TELEGRAPHY.

Mr. Delany's response to our editorial comment of the 3d inst., on the subject of rapid telegraphy, is a good *ex parte* statement of his position in the matter, and there is much force in his argument. The position of telegraphic operation in this country may be summed up in the statement that the great bulk of messages are sent by hand and written down by ear at an average speed of about 20 words per minute. The average telegram costs about 30 cents, and this is so expensive that the average American unit of population sends only about one telegram a year. It would probably be admitted that if the cost of telegraphing were reduced to nothing, or the wires were made free, while a service as good as now exists were still obtainable, nearly all the letters that now go by mail would be sent on the wire—love letters and important documents excepted. The present cost of telegraphing, therefore, radically stated, stands in the way of robbing the mails for the sake of the wires. On the other hand, it is clear, from the finances of telegraphy, that no material diminution in the cost of telegraphing can be expected under the existing system; so there exists a vicious circle of limitation. We cannot have a wider use of the telegraph without cheaper telegraphy, and we cannot get cheaper telegraphy with the present condition of telegraph traffic. Decided improvement may be expected from systems of the Buckingham type, which almost dispenses with the services

of the receiving operator, but all type-printing telegraphs must, by the natuer of their mechanism, be comparatively slow telegraphs, although several times faster than hand telegraphs. Consequently, type-printing telegraphs cannot finally cut the Gordian knot which ties existing conditions together.

Substituting machine transmission for hand-transmission will permit of handling more traffic, but not of reducing the expense of transmission to any great extent, and there will not be much more traffic until the cost of transmission is materially reduced. If, however, the labor of translating long hand into Morse, and Morse again into long hand, could be assumed by the public, so as to reduce the duties of the telegraph operators to superintending the successful transmission of the dispatches, the cost of telegraphy would be virtually reduced to the cost of superintendence, and the interest upon cost of wires and apparatus. Thus, if a business house in New York employed a stenographer who was also a Morse operator, and the same course were followed by a corresponding house in Chicago, then the manager of the New York firm could dictate his telegrams to his Morse stenographer who would transcribe his notes into perforated tape and a messenger boy would deliver this tape at the nearest telegraph office. The operator at the office would feed that tape in its turn through an automatic high-speed transmitter to Chicago. The receiving tape bearing the automatically recorded message at Chicago might be coiled up automatically at the rate of a thousand words a minute, if necessary, and the coil sent out by a messenger to the office of the Chicago firm. There it would be transcribed on a typewriter by the resident Morse stenographer. The cost of that communication of, say, 500 words, would be little more than half a minute's worth of the time of the New York-Chicago high-speed wire, plus the extra cost of the Morse power of the stenographers, plus messenger call service, minus 2 cents saved in mailing stamps. We think that Mr. Delany is fundamentally right in maintaining that all marked telegraph progress in the future must be in the direction of high-speed telegraphy. If it is not in that direction, what other course could it take?

POPULAR INFORMATION ON TELEPHONE RATES.

The manner in which errors of fact with regard to the conditions of telephone service are insistently repeated provokes the surprise of those who endeavor from time to time to set such matters right. This surprise becomes the more pronounced when the statements are repeated by newspapers known to be careful and worthy of crediting with the effort to be fair. As an instance of the latter nature we may refer to a recent editorial in the *New York Times*, which, in discussing telephone rates in this city, instanced a number of alleged figures from Europe, and added that in this city the local company charges $240 a year for a business telephone. As a direct consequence of this high charge, the *Times* stated there were only 42,500 telephones in New York. Now, the facts are distinctly contrary, and have been so set forth in our columns, which are read by the *Times* quite assiduously. We learn from the evidence given by Mr. U. N. Bethell, general manager of the New York Telephone Company, before the United States Industrial Commission, and quoted in these columns as well as those of the daily papers quite freely, that out of the 42,500 telephone subscribers in this city only 1400 are paying the old $240 a year rate, and it is the deliberate choice of every one of those few to pay that. With regard to the 40,000 subscribers not paying that higher flat rate, it appears that the average cost or yield per station per year is only $85. We may be wrong, but we think it will be a long time before telephone service in such a city as New York gets progressively much below that figure, whether there be competition or not. We are believers in the good done by independent telephony, and its ideas are frequently expounded in these columns, but there is a point at which any kind of telephone charges, whether independent or otherwise, become suicidal, and we are sorry to say that the tendency the last year or two in competitive telephony has been to give a service which was too cheap. The result is that everywhere throughout the independent ranks the telephone rates are not becoming lower, but are going up; and this is one of the healthiest signs we have yet seen in the movement. Last week we quoted some emphatic views on this point from an Indiana independent telephone man.

As regards the foreign figures quoted by the *Times*, we can only say that telephony in Europe from our personal observation and experience is not to be compared with telephony in America for efficiency and real cheapness. The *Times* falls back, for example, on the hackneyed instance of Stockholm. Putting aside the fact that Sweden is one of the cheapest countries in the world, we may point out that Stockholm has only one-thirteenth the population of New York, and that everywhere in the world telephone cost of operation increases with the size of the city. The *Times* quotes the Stockholm rate at $22. As a matter of fact, there is in Stockholm a fight between an energetic and enterprising local company and the Government, the company having twice as many subscribers as the official system. In order to get any kind of satisfactory service, a business man in Stockholm must use both systems. The least that this costs him is $40.50 a year, and every call interchanged between the two systems further costs the subscriber 2.7 cents. There are, moreover, limitations upon the service which a New York subscriber would not tolerate for one minute. There have also been absolute interruptions lasting for several weeks at a time, due to the fact that the wires were overhead and not underground. We may add that an official investigation in Holland elicited reports against the Stockholm figures as being too low, and that documents were laid before a select committee of the House of Commons also showing that the Stockholm rates were not high enough to warrant the maintenance of good service or could pay either the Government or the company. We might adduce a great deal of data along the same lines, but it would be familiar to our readers, and probably would not have much effect in stemming the tide of misinformation running through columns where one usually looks for something nearer the truth.

THE ELECTRIC SUBMARINE BOAT.

Recent reports from Toulon and Spezzia seem to indicate that the successes of the Holland boat in this country have stirred the marine Continental powers to unwonted interest in submarine navigation. The French, indeed, did pioneer work in this direction, and their "Gymnote," "Zede" and "Morse" have marked striking advances in the art. To judge from the reports which have filtered through the military and naval authorities, the Italian experiments have also been highly successful, and the next war between first-class powers may show some immensely interesting developments. It is a far cry from the ill-omened "David" that forever disappeared alongside the shattered "Housatonic," to the handy Holland boats and their foreign rivals, but there are few recent lessons in military and naval affairs that were not clearly foreshadowed in our Civil War, and the submarine boat is no exception. It only needed the development of the storage battery and the stimulus of a rising warcloud to stir inventors into action and governments into temporary flurry. The storage battery of to-day seems adequate for motive power if great speed is not attempted, and the rest is merely a delicate piece of marine engineering with the Whitehead torpedo for a working prototype. The experience derived from the latter seems to indicate, by the way, that a well-shaped body entirely submerged drives with very remarkable ease, and the porpoise rather than the pickerel seems to be the model for high speed.

Great speed in a submarine boat, however, seems to be a rather dubious virtue, not at all to be compared in importance with easy manageability and good radius of action. There is no trouble whatever in carrying battery enough for any speed at which it is safe to manœuvre the craft, even with the present lead cells, while if the new Edison battery fulfills the hopes of its inventor, its small weight and freedom from noxious fumes should make it a favorite in such work. It is hardly to be expected that submarine yachting will ever become a popular pastime. We shall never hear that the "Green Shark" ran down a submarine grocer's wagon or raced the "Blue Devil Fish" to a finish up the Sound. For even the ELECTRICAL WORLD AND ENGINEER would be stumped to report the proceedings; and what glory in a race without the reporter standing by to do it justice? There will be plenty of stimulus for a long time to come in wars and rumors of wars, and now that the art is fairly under way we shall expect the next few years to show sensational advances. The first bit of really hard fighting will try out the possibilities of the new craft in a way that will be intensely interesting, to say the least. We have always regretted that neither the Lake nor the Holland boat was given a chance at Santiago. Any other power would probably not have failed to grasp such an opportunity of testing a new and potent engine of war. A submarine cable-cutting cruise on the bottom of a hostile harbor would have done wonders in testing the practical value of the boats and in teaching their real place in warfare. As it is, they are still emphatically a very uncertain quantity, the importance of which is largely a matter of guesswork. Their advocates claim for them a revolution in the art of war, while there are those who hold that they are of little use save in a dark night and a narrow channel.

From all that we can ascertain, the modern electric submarine boat functions excellently from merely an operative standpoint, but has a very tough time in finding her way about. Against a ship at anchor in a well-defined position, a campaign ought to be, and apparently is, a fairly simple matter, but an attack on even a slowly-moving vessel would be in most waters something after the manner of chasing a black cat around a coal cellar at midnight. Mr. Holland, who certainly should understand the possibilities of submarine navigation as well as any one, is quoted as saying that the difficulties of finding one's way are so great that there is no defence against a submarine attack—not even another boat can be of any service; so that battles between such craft are almost out of the range of possibility. Obviously, the same causes act to render difficult any attack on a floating fort. But here, it seems to us, is a chance for electrical skill again to come to the fore. Given a successful method of communicating between a submarine boat and the shore, so that information could be freely exchanged, and the problem of coast defence at least would be greatly simplified. Even so it may turn out that boats of the Lake type prowling along the bottom like gigantic and malevolent crabs, have a certain advantage in utilizing landmarks at the bottom, nosing along like a steamer in a mist. But be this as it may, a method which will enable the crew of a submarine craft to locate themselves quickly and with precision would be of fundamental importance in their use for harbor defence. And until something of the kind is forthcoming, it looks as though submarine cruising would be of somewhat limited use. One can easily imagine a boat coming to the surface to locate an enemy, diving for the attack and then getting caught in a swirl of current and ending her career on a sunken rock or mudbank. An underwater cruise will probably never be attractive for nervous people, but a practical system of navigation at or near the bottom would at least rob it of some of its dangers and uncertainties and put submarine warfare on a far sounder footing than at present. Possibly the acoustic signaling system with which the late Professor Gray was so closely connected, might lend itself to such a task, but we are only suggesting the problem rather than attempting to solve it. With most of the Powers equipped with submarine boats, the advantage lies with the craft that can be most easily used, and this, to our mind, is the one that can be reasonably sure where she is going next in the perpetual London fog of a harbor bottom.

THE ELECTROMAGNETIC EFFECTS OF MOVING CHARGED SPHERES.

In the *American Journal of Science* there appears a paper by E. P. Adams upon this topic which is theoretically of great interest, although not of much practical importance at present. It was indicated by theoretical considerations some 25 years ago that an electrostatic charge when moving at a velocity small by comparison with the velocity of light, acted like a flow of electricity in a conductor, and was capable of exerting a magnetic force in its vicinity in the manner of an active electric conductor. Expressing this result in another way, a mechanical carriage of electricity was inferred to be analogous, in its local magnetic effects, to a flow of electricity. The late Professor Rowland won his first honors as a physicist by experimentally demonstrating this magnetic effect of a moving charge in 1876, and similar results have been obtained from time to time by other experimenters. Recently, however, M. V. Cremieu, of Paris, has thrown doubt upon the experimental results, by describing experiments of his own in which no such effects were obtained, and, in fact, he stated that he was convinced that the effect did not really exist. Mr. Adams' paper here considered describes experimental results recently obtained going to show that Cremieu has been deceived in some way by his results, and that the Rowland effect does exist.

When an electric charge is whirled in a circle about an axis, the mean electromagnetic effect in its neighborhood, according to the theory in question, is equal to that of an electric current delivering the same electric quantity per second, around a turn of wire coincident with the path of the revolving charge. Since the effect is always very small, because the charge is small, it can only be made apparent by moving the charge with great speed, so as to increase correspondingly the aggregate equivalent electric quantity passing per second, and by placing a sensitive electromagnetic needle in the most advantageous position to be acted upon by the magnetic force expected. In the case under consideration, there were 16 brass balls, about 1 inch in diameter, mounted at equal radial distances (about 8 inches), from a revolving shaft so as to magnify the effect of one charge 16 times. Each ball was charged to a potential of approximately 19 kilovolts, and the speed of the balls in their path was between 2 and 3 miles per minute. The result was to produce the equivalent of a current of a few microamperes circulating in a single turn. A similar set of balls was rotated in the neighborhood with opposite electric charges, for the purpose of obtaining a more definite distribution of the revolving electric field. A delicately suspended and sheltered set of astatic magnetic needles showed a distinct deviation under the influence of the rotating balls, and the magnetic force exerted was apparently of about the right magnitude. The pressure of 19 kilovolts, or 63 electrostatic C. G. S. units of potential—a fearful rhodomontade of description rendered necessary owing to the absence of a name for this unit—was produced by a storage battery of 10,000 cells. Assuming that the results are as reliable as they seem, it follows that just as a moving magnetic charge is the known equivalent for a magnetic current, or time rate of flow of magnetism, so a moving electric charge is the equivalent of an electric current, or a time rate of flow of electricity.

The Institute Convention.

In accordance with the programme announced last week and carried out as recorded in these columns up to the time of our going to press, the members, their foreign guests, etc., visited the Crocker-Wheeler works at Ampere on Thursday, Aug. 15, and were received by President Wheeler and Mr. Dunn. They made a thorough inspection of that interesting establishment, and returned to the city in the afternoon. In the evening a dinner was given at the Hotel Marlborough at 7 o'clock, and was attended by about 100 in spite of the extremely disagreeable weather and the absence of so many members of the Institute from the city at this season of the year. The dinner was presided over by ex-President Carl Hering, and speeches were responded to as follows: "The Land of Ampere," by M. Janet; "The Countrymen of Faraday," by Mr. N. C. Sawers; "The Successors of Ohm," by Professor W. Hallock; "The Heirs of Volta," by Mr. P. Torchio, and "The Legatees of Franklin," by Dr. S. S. Wheeler.

Next morning the members and friends, as guests of the New York Edison Company, Brooklyn Edison Company, Metropolitan Street Railway Company and the Manhattan Railway Company, embarked at 9.30 on a special steamboat and were transported to the riverside power plants of these companies. The Edison interests were represented by Messrs. Murray and Lieb, the Manhattan by Messrs. Pegram, Baker and Harrison, and Brooklyn Rapid Transit by Mr. Roehl. Luncheon was served on board and a most instructive day was spent by all, the trip ranging from the Bay Ridge station on the extreme south, to the Metropolitan station at Ninety-sixth Street on the extreme east.

There were no assignments for Saturday, which left time for private entertainment, and on Sunday morning, in spite of the extremely bad weather, a large party embarked on the special steamer "Montauk" for Albany. The day was spent in making the trip up the river with every condition favorable except that of climate, and in the evening on reaching Albany the party took dinner together at the new Ten Eyck Hotel, spending the night there. Next morning the party, as guests of the General Electric Company, proceeded to Schenectady from Albany by special train and spent the forenoon in wandering over the enormous works of that corporation. At midday luncheon was served in one of the newer shops and then the party proceeded by special train to Buffalo, putting up at the Niagara Hotel as its headquarters.

Beginning with Tuesday morning the convention assembled for business in the New York State Building and the rest of the week was devoted to the discussion of the programme, which has already been published. Thursday was Electric Day at the Exposition in honor of the visit of the Institute.

A Royal Trolley Car.

A magnificent royal car—probably the first in the world built for royalty—is now under construction by the Ottawa Electric Railway. The company is not sparing expense to make it one of the best electric cars that has ever run on any track. It is to be finished in a most elaborate manner, and on the front will be painted the name of the car, "The Duchess of Cornwall," and on either side will be carved the royal coat of arms. The car is to be finished in the royal colors, and on the inside, besides the fancy brass work and plate mirrors, will be a number of wicker and upholstered chairs. The car will carry the royal party to Britannia, where the Ottawa lumbermen will have a timber crib, which will be boarded for a trip through the Deschenes rapids and down the timber slides at Chaudiere Falls. The design of the car has been approved by Lord Minto and Sir Wilfrid Laurier.

St. Paul's Cathedral.

A special dispatch from London, says the architects' report to the Dean and Chapter of St. Paul's Cathedral reveals a really alarming condition in that edifice. The present damages can readily be repaired, but the danger is that St. Paul's, London's most splendid architectural monument, may have to give way to the march of progress. The building of the old underground railway tunnel caused some settling of the foundation, and the later tunnels caused perceptible, even alarming, damage. But tunnel railroads, sewers and other improvements for the public safety and comfort London must have, and the cathedral floated on sand and wet gravel may yet vanish.

Electrical Engineers of the Day—VIII.

E. J. BERG.

Ernst Julius Berg was born in Östersund, a small town in northern Sweden, in January, 1871. After completing the course in the High School of his native town he entered, at the age of 18, the Royal Institute of Technology in Stockholm, from which he was graduated in 1892 with the degree of Mechanical Engineer.

Immediately upon leaving college he came to this country with the intention of completing his engineering studies. After some experience in the manufacture of printing presses, he sought more congenial work in electrical engineering and secured a position with the Thomson-Houston Electric Company. He was quickly placed in charge of a division of the drafting room, and then began a series of experimental researches, during which, among other things, he developed the magnetic blow-out idea into the now almost universal blow-out fuses and circuit breakers.

On the transference of the engineering department of the General Electric Company to Schenectady in 1893, Mr. Berg was made assistant to Mr. C. P. Steinmetz in alternating-current designing. He directed the experimental work of the company and contributed largely during this time to the development of the monocyclic system, alternating-current motors, feeder potential regulators and many other details of alternating-current work, long since become standard.

From a subordinate position Mr. Berg soon became Mr. Steinmetz's right-hand man. He was among the very first to recognize

the advantages of the method of mathematical treatment by complex imaginary quantities, then advocated by Mr. Steinmetz, and to actually employ this system in everyday work, and, as a natural result, their many investigations at this time led to the writing, in collaboration, of the first complete treatise on the more complex alternating problems, viz., "Alternating-Current Phenomena."

For the past few years Mr. Berg has devoted much time to the design of alternators, induction motors and rotary converters, and to such related problems as the hunting of rotaries and the parallel operation of alternators, and has been granted many important patents relating to these and other lines of work. More recently he has been working on railway problems, especially with a view to the employment of alternating-current motors and high-potential trolleys.

In his presidential address to the Institution of Electrical Engineers last November, Professor John Perry said: "The engineer must be a real man; he must possess originality, the power to think for himself. * * * The man who is permeated by theory, whose theory is so much a part of his mental machinery that it is always ready for practical application to any problem, he is the real engineer." Mr. Berg's associates know him to be a *real* engineer, one who can calculate, who always in attacking a new problem first derives its equations. To him others often turn for precise figures where they must perforce surmise, to calculate or design what they devise, to locate trouble and find a remedy when others have failed.

He is a member of the American Institute of Electrical Engineers, and has read several papers before that body.

From Christmas Tree to Pan-American.

THE HISTORY OF ELECTRICALLY-ILLUMINATED TOWERS UP TO THE PAN-AMERICAN EXPOSITION.

By LUTHER STIERINGER.

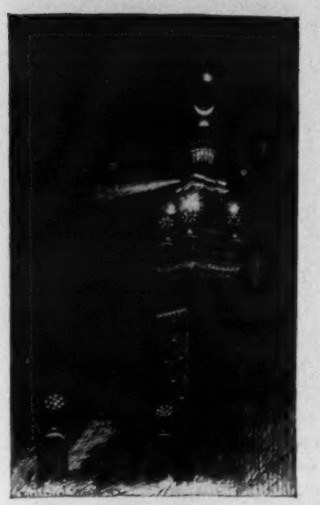


FIG. 1.—SEVILLE TYPE OF TOWER.

THE first object approximating a tower upon which electric lights were placed for spectacular effects was a small Christmas tree which Mr. E. H. Johnson, then president of the Edison Light Company, placed in his New York residence for the amusement of his children in 1882. This tree was decorated with miniature lamps, which were colored by being covered with different colored silks. A photograph of this tree is shown herewith. The tree was revolved, and the lights were turned on and off by a commutating switch. This was also the first instance of commutation of the kind.

In 1883, at the Foreign Exhibition, in Boston, held at the Mechanics' Fair Building, one of the notable and most popular features was the Christmas Tree and Children's Festival, under the auspices of the prominent ladies of Boston. A mammoth Christmas tree was placed in the middle of the large hall, and in the center of the band stand. This tree was perhaps the largest ever placed in a building—at any rate, up to that time—being 50 ft. high, with 30 ft. spread. It was decorated with 160 lights of 10 and 16 candle-power. These were among the first of the incandescent lamps of less than 16 candle-power. The 10-cp lamp was at that time developed by the Edison Company for the use of small village plants where economy was desired. The various circuits on this tree had different colored lamps, which were turned on and off, or "played" in time with music. For this tree an elaborate commutator had been provided to manipulate the lights. This, however, was never used. Reliance was placed instead on a switchboard concealed from the audience and manipulated by an operator conversant with the music. The method of manipulation was kept a secret from the public, and this lent an air of mystery to the affair. The only person who was favored by admission to the operating room was the great singer, Christine Nilsson, who was so pleased with the performance in light, on the Christmas tree, that she was given an opportunity to play a tune in colors. This tree, a photograph of which is shown, was such a "drawing card" that it not only attracted large crowds from Dec. 15 to Jan. 1, but was the means of keeping the Foreign Exhibition open two weeks after its intended closing time, Jan. 1.

The Louisville Exposition of 1883 presented for the public enjoyment an illuminated circular water tower 30 ft. high, the top of which was encrusted with a large number of incandescent lamps. The shaft had at intervals a number of circular tablets. Intermediate between these were perforations of different design. These were covered with colored glass and lighted from within. Water was allowed to flow through and over the moss-covered tablets, descending from terrace to terrace and finally collecting in the basin in which the tower was placed.

At the Electrical Exhibition under the auspices of the Franklin Institute, at Philadelphia, in 1884, the first electrically-illuminated tower, column or shaft was erected. It was crudely constructed with a base, a pillar, and a cap, of no particular form. The base of this shaft had as an inscription the word "Edison," in which the letters were flashed successively. The shaft was entirely covered by incandescent lamps, the number of which represented the daily output of the Edison lamp works at that time. (See accompanying cut.) Interspersed among these lamps were a number of other lamps which were flashed or lighted and extinguished alternately at short intervals. A few lamps were also placed in the cap for permanent illumination. This tower was essentially a great novelty, owing to the rapidity with which the lights could be extinguished, thus indicating the marvelous control possible with the incandescent lamp.

Nothing material was done from the time of the Philadelphia Exhibition in this kind of spectacular lighting until 1890, although a structure was shown at Paris in 1889, in the Edison exhibit, which being in the nature of a booth could not be classified technically as a tower or shaft.

In 1890, however, as a new point of departure, there were several comprehensive tower installations. The Woman's Exchange exhibition at Lenox Lyceum, New York, had the "Tower of Light" of the Edison exhibit as its principal feature. This was the first tower to be lighted with miniature lamps. These were used because being in an interior the number of lamps necesary to produce the effect would have been too dazzling and would not have been in harmony, if larger than 4-cp lamps had been used. In the center of the hall a hollow white column 25 ft. high was covered with hundreds of lights arranged in spirals from top to bottom. Festoons of lamps were suspended from the tower to the galleries, the cords covered with green asparagus vines. This tower also was manipulated responsively to music from a concealed switchboard. The column was built by a stage expert and covered with canvas painted pure white flecked with mica scales. In appearance it was like a shaft of pure white marble.

At the Minneapolis Industrial Exposition of 1890, following that of the Lenox Lyceum, the Edison exhibit shown at the Lyceum was again presented, except as to the tower. Something of a comprehensive character was demanded at Minneapolis, to be placed and treated as the main feature of the exposition. In the center of a large hall, the Egyptian Tower of Light, a column 60 ft. high was erected in the form of a lotus flower, the tower as the stem, with its purple ribs at every angle of the octagon, the swelling top as the flower with its petals and sepals strongly defined. (See cut.) The

FIG. 2.—TREE LIGHTING EFFECT, 1882.

long stalk was studded with changing lights manipulated in time with the music of an orchestra. The surface lighted on this tower was over 4000 square feet, and was covered with 10,000 5-cp lamps. To obtain a scintillation effect, "diamond dust" was spread over the

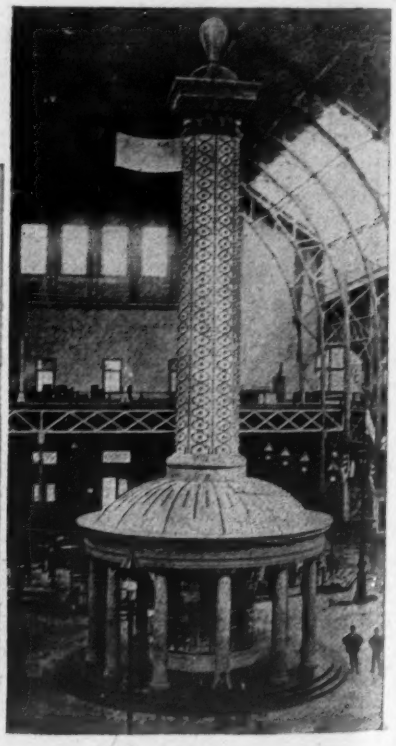
surface. The lighting on this tower was also manipulated from a concealed keyboard by an attendant familiar with the music rendered. The manipulator was thus enabled to present just the combination desired. For example, when the band played "The Red, White and Blue," the colors were flashed at the instant the words were rendered in the band's stirring refrain, making it a thrilling moment to both eye and ear. At the opening, the tower accompanied Reeve's Band, and finally, toward the close of the Exposition, it was associated with the celebrated Strauss orchestra, in particular in the closing piece of music, the beautiful Blue Danube waltzes.

FIG. 3.—PYRAMIDAL TREE LIGHTING EFFECT, BOSTON, 1883.

This time (1890) was an exceptional year for the building of electrically-lighted exposition towers. Following Minneapolis, the Mechanics' Fair at San Francisco had an illuminated pillar 22 ft. high, poorly constructed and continuously lighted. An attempt was made in this to duplicate the Lenox Tower. The use of 16-cp lamps would alone have been enough to make it a failure if nothing else. A photograph of this tower is shown. The last tower for the year and for some time, was at Portland, Ore., and was installed in the large hall of the Portland Exposition with embellished surroundings. This was of different design from the Lenox Lyceum tower, but had the general features of manipulation of that structure. It was operated in rhythm with music as an accompaniment.

For the World's Columbian Exposition of 1893 there was designed an electric tower in keeping with the demands of an exposition of such magnitude. The central position of an exhibit building is usually reserved as a place of honor for the choicest exhibit or feature. In the Electrical Building at Chicago the central space was allotted by the chief of exhibits in that department to a glass company which proposed to erect thereon the booth shown in the accompanying engraving, which was nearly complete before the management conceded that it lacked size as well as character, aside from inappropriateness. The Edison General Electric Company had had a design drawn for a centerpiece of its exhibit, to be located in this building, and to be the main feature of the exhibit. The central space having been already allotted, the result was a compromise with the glass company and a modification of the structure. To accommodate the glass company, the column or shaft was surrounded at the base with a circular colonnade, thus enabling the glass concern to display its wares that were applicable to electric uses. Its original display was to have been entirely of cut glass. However, arrangements were finally effected satisfactory to the glass company comprehending a new design and the abandonment of all the work done on the original booth. The pedantic artistic requirements of the management demanded that every structure erected in exposition buildings should conform to the conceptions of propriety and the critical indorsement of a board of artistic censors.

When the design of this tower was submitted for consideration to meet the conditions and requirements of the time, there were objections raised to a colonnade surrounding a shaft as not being correct in architecture. The designer happened to recollect, however, that the Washington Monument in its original design had a circular colonnade with quadrigas surrounding a square shaft, but he was unable to secure a copy of this interesting drawing at the moment, and fortunately in his search found that the Column of Victory in Berlin, Germany, which is accredited with being



FIGS. 4, 5, 6 AND 7.—ORIGINAL DESIGN, PROTOTYPES AND FINAL RESULT, EDISON TOWER, CHICAGO WORLD'S FAIR, 1893.

FIG. 8.—EDISON TOWER, PHILADELPHIA, 1884.

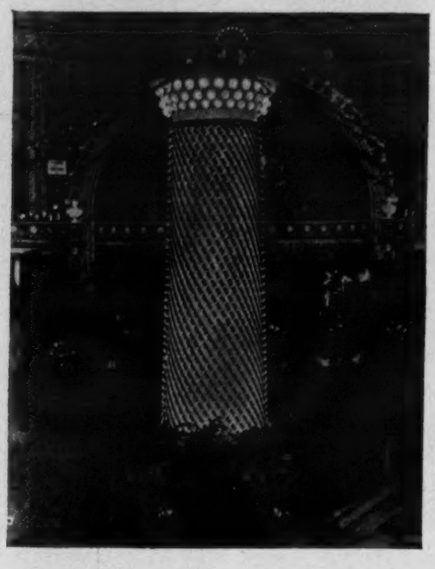


FIG. 9.—"TOWER OF LIGHT," LENOX LYCEUM, NEW YORK, 1890.

FIG. 10.—EGYPTIAN TOWER OF LIGHT, MINNEAPOLIS, 1890.

FIG. 11.—ELECTRIC TOWER, PORTLAND EXPOSITION, 1890.

FIG. 12.—PILLAR OF LIGHT, MECHANICS' FAIR, SAN FRANCISCO, 1890.

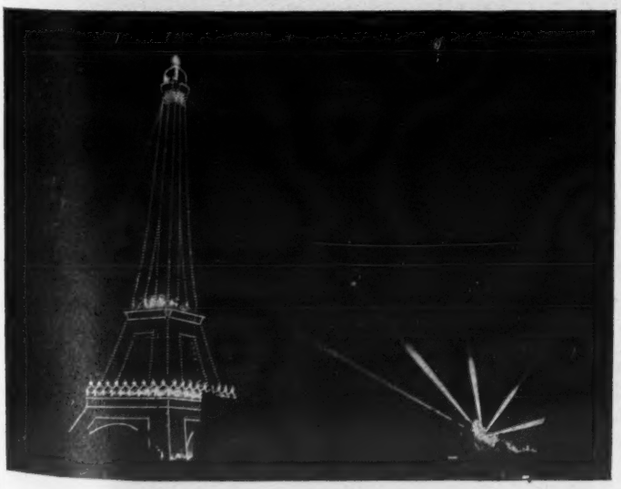


FIG. 13.—THE EIFFEL TOWER EFFECT IN 1900.

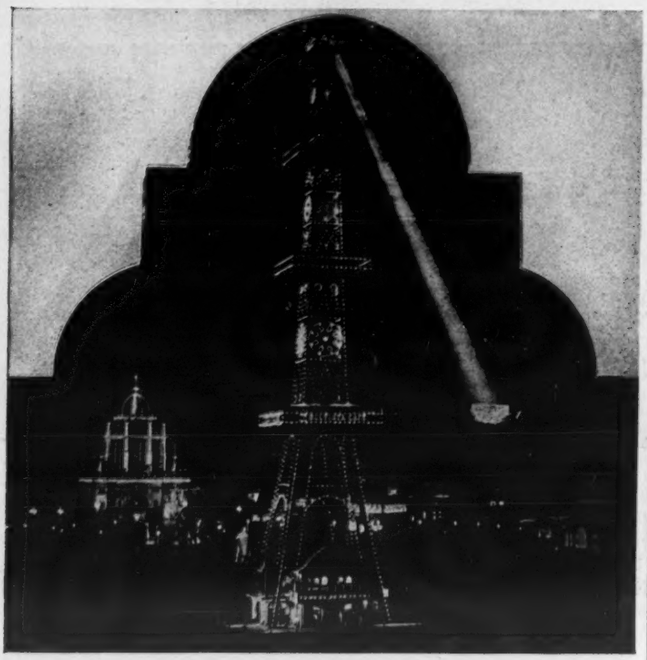


FIG. 14.—BONET STEEL TOWER, MIDWINTER FAIR, SAN FRANCISCO, 1894.

ELECTRICALLY-ILLUMINATED TOWERS UP TO THE PAN-AMERICAN EXPOSITION.

a masterpiece, was surrounded with a circular colonnade. When the designs were finally submitted to the lamented Mr. Chas. Atwood, designer-in-chief, he indorsed them without further question as to their architectural and artistic accuracy. Columns, shafts and triumphal arches are the only forms by which to depict achievement. In the case of the Berlin shaft, it is surmounted by a figure of Victory, typifying

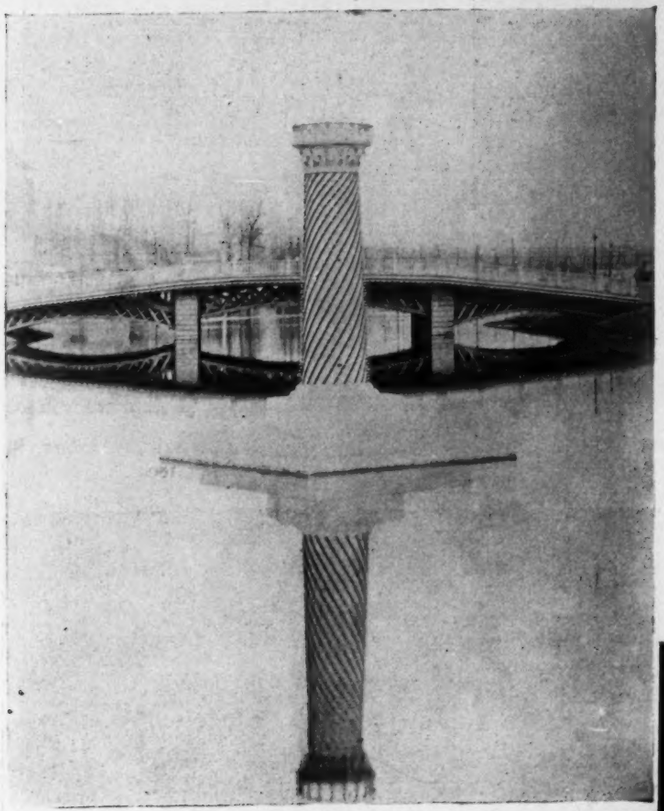


FIG. 15.—THE MIRRORED TOWER, ATLANTA EXPOSITION, 1895.

success attained. The Edison Tower at Chicago was surmounted with an incandescent lamp, typifying the achievements of that remarkable creation of inventive genius.

The cap and shaft of classical design were made commemorative of this achievement by an embellishment of its exterior with over 8000 incandescent lamps in color, capable of giving rhythmic expression, as they did on the opening night, June 1, 1893, when they accompanied Sousa's band. With what results to the popular eye and

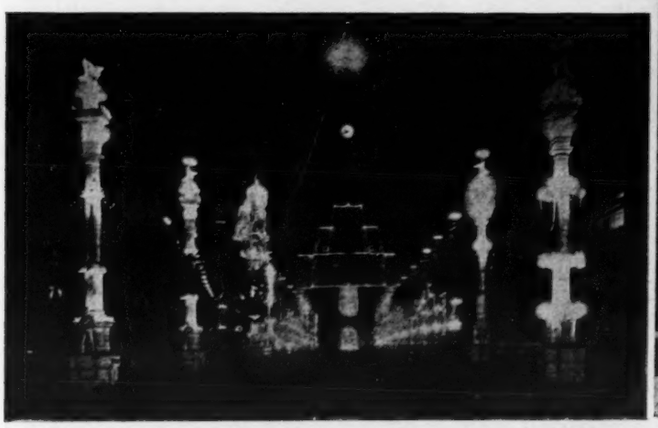


FIG. 16.—TOWER AND STREAMER EFFECT, PHILADELPHIA, 1901.

ear can best be judged by a quotation from the account of the unveiling that appeared in a Chicago daily paper:

"Six minutes past 8 o'clock the broad canvas sails hanging from the center of the roof were swiftly lowered to the floor. As they dropped downward, first the glittering apex and then the massive pillar of the tower of light was disclosed to the thousands of eager spectators that packed the main floor and galleries of the building. As the streamers of white rustled softly to the floor a band stationed in a distant gallery played the sweet strains of a well-known waltz. The instant the music began the great shaft quivered and seemed to start into life. From its massive base to the flower-like bulb at the top it became a shimmering, sliding maze of shifting color. Slowly the lines of fire crept up and around the shaft, falling, circling in and out, now blazing in a mad riot of light and color that blinded the eyes and an instant later sinking into a tender glow, subdued and motionless. Suddenly the musicians swung into a livelier strain and every jet danced a rollicking accompaniment to the air. It was a bewildering, delicious riot of sound and color so strangely blended that the two seemed to move by some common impulse. The conductor's baton controlled, not only the music, but swayed as well the intangible mass of color. As the music became slower and finally died away, the lights too disappeared, only to burst into now dazzling brilliancy at the first sound of the waltz. The operators of the keyboards and rotating switches followed the music perfectly, playing with the intangible rays of light as though they were showering them from their hands. Over 8000 incandescent lamps made up this silent but eloquent orchestra of light and color."

This Edison light tower, in order to be in harmony with the immense height of the building was 110 ft. elevation. The crystal lamp at the top, which was illuminated from within, was made up of over 10,000 separate pieces of light-refracting cut glass. To refresh the reader's memory, a picture of the tower is presented herewith. Full details of this tower are to be found in the *Electrical Engineer* of June 7, 1893. Had it been possible to have secured a dark environment or an exterior setting this column would have been still more pleasing and created still greater enthusiasm. It must be appreciated that in an electrical building there is an excessive amount of light, and semi-darkness is hard to attain.

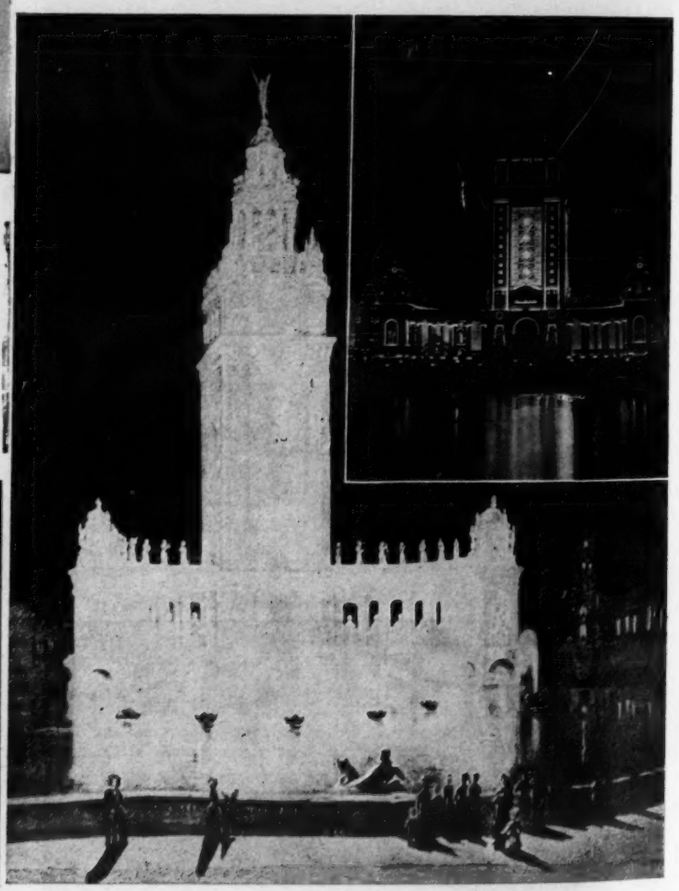


FIG. 17.—PAN-AMERICAN TOWER; THE DREAM AND THE REALITY.

The Midwinter Fair at San Francisco coming next, in 1894, had, as its main feature, a central steel tower designed by Leopold Bonet. This tower, which is illustrated herewith, contained an elevator, and was called an "electric tower," probably from the fact that it was covered with electric light.

Electric towers of recent date seem in their original conception to

rely on a figure or symbol incorporated with them for the purpose of designation, and only become "electric towers" when clothed with illumination sufficient for them to impress the public as such. The San Francisco tower in height and general construction had but one superior, the Eiffel. It was 272 ft. high. It was outlined at night

FIG. 18.—DAYLIGHT VIEW, ELECTRIC TOWER, PAN-AMERICAN.

by 2000 incandescent lamps, showing the outline proportions. On the four sides of the tower at different elevations were shields, wreaths, crowns, etc. By means of an automatic switchboard, lights that were used in the shields, etc., were made to come and go in a

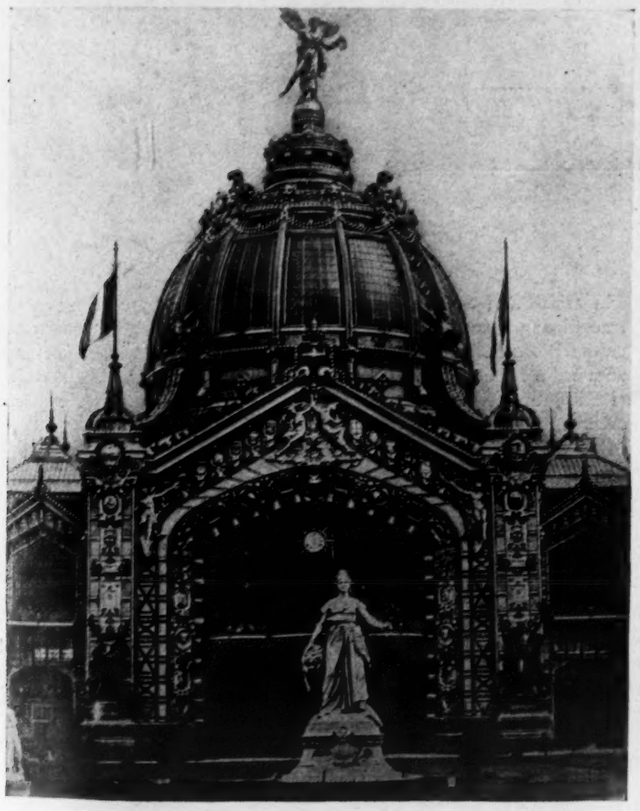


FIG. 19.—DOME AND FIGURE AT CREST, FOR SEARCHLIGHT EFFECT, PARIS, 1889.

constant play of colored lights, appearing and disappearing. There were 1200 lights connected with this automatic switch, 800 of which were colored. This tower being new in its arrangement, novel and well situated, was very much admired. It was surmounted by the largest searchlight ever built, which in the clear atmosphere of California had a marvelous range.

At the Atlanta Exposition of 1895 a special design and new application of tower lighting was shown in the form of the first tower ever built to float on the water, thus reflecting the illumination pro-

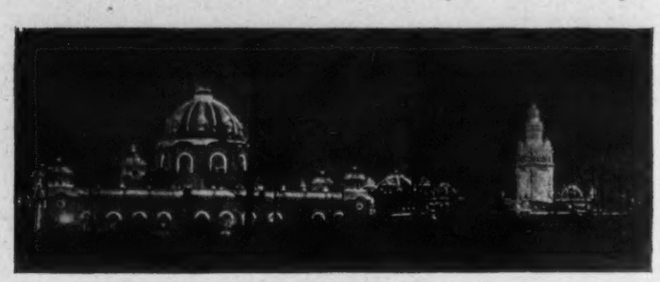


FIG. 20.—NIGHT VIEW OF THE PAN-AMERICAN.

vided on the tower. This tower had several thousand miniature lamps, many of which were in color and followed the general lines of the Lenox Lyceum and Portland towers. Even without the lights, it was an important element in embellishing the lake in which it floated. (See cut.)

The world-renowned Eiffel tower was mantained from the 1889 Exposition at Paris until the Exposition in 1900 and still stands, but was improved for last year's show by painting it a more cheerful color. It was also outlined with incandescent lamps and had a more pleasing appearance than in 1889. At this 1900 Exposition there was also shown an illumination on a 300-ft. tower of the same generic class as the tower of Seville, and Madison Square tower. The illustration shows this lighted.

There have been quite a number of permanent towers throughout this country, and the world which have on festive occasions been illuminated with symbols or designs typical of the occasion, but a

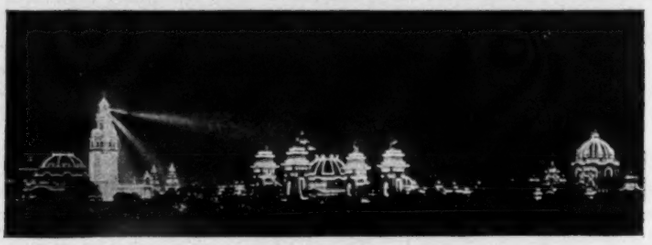


FIG. 21.—PAN-AMERICAN WITH SEARCHLIGHT EFFECTS.

recent illumination made in Philadelphia on the William Penn Tower of the City Hall on the occasion of the dawn of the Twentieth Century celebration, calls for attention from the fact that great expense was incurred and much thought given to the effort to make the illumination of this building worthy of the occasion. It will be seen from the photograph of this and the other towers submitted that the effect at Philadelphia could hardly be worse, artistically considered. This illustration had probably never been seen by a New York *Times* correspondent on art when he made the following

FIG. 22.—NIGHT VIEW OF ELECTRIC TOWER AND ENVIRONMENT.

suggestion as to one way to improve the Pan-American tower. "A dozen big ropes well studded with lights stretched from the electric tower to convenient near-by points would add greatly to the effect without adding to the expense, but some experience was necessary

to teach the managers that a line of lights on a dark night looks just as well strung from a long rope or a pole as from a pile of masonry." The photograph of the absurd Philadelphia effect speaks for itself as to the results of experience in this respect.

The Pan-American Electric Tower is the main lighting feature of the Exposition. The crowning feature of this tower is the "Goddess of Light." The wings are to symbolize the swiftness of light; the torch which she holds aloft in her hand, brightness. This may suggest to the refined and educated an association with electricity in the daytime. The rest of the tower and its colonnade in no way suggest an association with the subject of its title, but perchance are recognizable to the general public, if such association exists at all. Nearly all towers of this order derive their titles from the sculptural conceptions that surmount them, such as the celebrated tower of Seville, the Madison Square Tower, and most notably the William Penn Tower in Philadelphia, which is the loftiest tower of this order in existence (540 ft.), and is surmounted by a heroic figure of William Penn. A statue is usually incorporated in the design to symbolize an idea or commemorate some event; and ultimately perhaps even the Smith family will be honored in this way as a fitting recognition of its great family. In this instance a "composite" could give no offense. If the figure on the Pan-American Electric Tower manifested any electrical idea—plain or composite—beyond its name and the flambeau or torch (which torch represents but the flaming fagot of the ancient and not the embodiment of electricity so well depicted by Franklin and his kite) a connection might be seen between electricity and the surmounting statue. An old German proverb maintains that paper is very tractable and permits of all sorts of liberties. So, too, the conceptions of this tower artistically depicted in the many illustrations and lithographs freely circulated prior to the actual illumination showed a luminously electrified structure, which had the appearance of being lighted from within, as if constructed of glass, producing a translucent and luminous effect not unlike the miniature chalk towers on street sale by Italian venders some years ago. (See cut.) If such an effect were obtained by external light it could only be ensured by placing a model of the tower in an absolutely dark background so that no light would be reflected and illuminating it by powerful searchlights or projectors. This latter treatment was suggested for the "Goddess of Light" on top of the tower. It had been successfully carried out on the figure above the dome of the Palais d'Arts at the 1889 Exposition at Paris, and the same effect can be seen nightly at Buffalo when the searchlight is turned on the "pylons." Had the Goddess of Light been left light in color as recommended, instead of gold gilded (an absorbent of light), it could have been made one of the most effective features at the Pan-American Exposition, and would not have needed any other artifice at night to show that the figure held in its hand an emblem of light, which fact the bright daytime discloses on painfully close study with a telescope. The great public needs something more than an ideal to satisfy its electrical expectations. Therefore, whatever form this tower was intended to depict architecturally was of little moment except as to the advantages its construction offered for a display of the festive order that would be appreciated, thus partaking of the decorative at night instead of the structural. Lighting is not a matter strictly for architects, but a special art, and the subject of special investigation for those who have to deal in addition with the complex problem of installation. No matter what beauty the architecture may possess, if a funereal aspect is to be presented on occasion, the mourning colors of a country must be chosen to drape the structures, be that white, yellow or black. If the occasion be festive in daylight, bunting in the skilled hands of the decorator will attain a festive transformation. A festive scene at night can only be effected by the aid of illumination and in no way can it be construed as incorporated in the architecture, but it is rather associated with it, and when removed it leaves no evidence of its prior existence. Had it been possible to have treated the illumination of this tower from the inside by translucency to secure a luminous effect, it would have resulted in showing up its grim steel skeleton like an ugly radiograph or X-ray picture. A translucent and luminous appearance is produced in an entirely different way from all preconceived notions of the uninitiated. This effect was attained by placing lights so as to secure a nearly uniform illumination over its surface with all desirable points accentuated, producing an effect of brilliancy. The great height and size of this tower and the increased amount of light apportioned to this central section would have made it effective in a popular sense with almost any treatment. The white and pale green background reinforces the brilliant effect of the lights more than is generally appreciated.

This tower could have been arranged to serve the purpose of a spectacular display by arranging the lamps under sectional control and operating them at stated intervals, if such had been desired. The placing of bunting or of any emblems of mourning on a structure will not change it from the doric to the ionic or corinthian. The lights are decorative, absolutely, when used festively. When it is considered that many centuries have passed and that only recently the scientist, inventor and engineer have produced a medium of light that would permit of the arbitrary positions which the units on this tower assume, we see the great progress that has been made. When combined with the beauty that the arts may furnish for a fine background the opportunity afforded in the future for this class of illuminating work is full of suggestion to the expert or specialist who follows the development of illumination for decorative applications.

A longing weakness of human kind is to soar skyward. As an example, there is presented herewith a series of designs of steel towers (Fig. 23) that were proposed to rival the Eiffel tower. These were designed shortly after the famous Eiffel tower was erected. As shown, they suggest an exceptional opportunity for illumination.

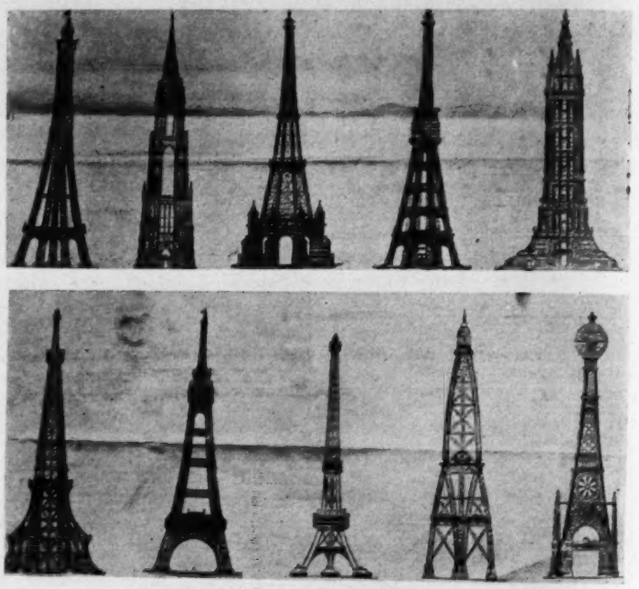


FIG. 23.—DESIGNS OF PROPOSED TOWERS FOR LONDON, FOR ILLUMINATION, ETC.

Their size and extensive outline would admit of producing an extraordinary spectacular effect. If the architectural designer could clothe the exterior of one of these tall steel towers in ornate form and make suitable provision for the association of light, a spectacle rivaling the wildest fancy of the most imaginative mind could be created.

Good Roads for Automobiles.

Of the difficulties met with in the past, cost has been the principal obstacle to the building of good roads in New York State, according to State Engineer Bond. The farmers, who have the most to gain from improved highways, but who have been slow to appreciate this fact, are now represented to be generally in favor of the movement. Applications under the Armstrong-Higbie law for road improvement are piling up in the State Engineer's office, the $420,000 appropriated by the Legislature for the year, although the largest amount yet given, being much too little to meet all the requests. With a reduction in the cost of road building, the State appropriation could cover more ground, and to this problem of a reduced cost Mr. Bond has been devoting his attention. He thinks he has found the solution in the proposed establishment of a State rock-crushing plant, near Rockland Lake, across the Hudson from Sing Sing, where the convicts could be employed in converting the trap rock, abundant there, into road metal. He regards the location as excellent for the purpose, and would expect the returning canalboats to carry loads of broken stone up into the State at cheap rates, rather than to go back light.

Electrical Supply in Bangor, Maine.

BY ALTON D. ADAMS.

PUBLIC electrical supply at Bangor, Maine, has been reduced to a condition of ideal uniformity by the Public Works Company. In other words, about 14,000 incandescent lamps, more than 200 horse-power capacity in electric motors, and several hundred enclosed arcs, are all operated by the same generators. Add to this the fact that a nearby water-power is the source of energy, and the main conditions for reliable, economical and satisfactory operation, both for the electric company and the public, seem assured. Bangor, a city of 21,850 population, the metropolis of Eastern Maine, and an important center of wholesale and retail trade, is a relatively large consumer of electrical energy, as the figures just given show. The business portion of the city is well grouped for electrical distribution, on several important intersecting streets, but an excellent class of residences, among which there is a good demand for light, are scattered over a much larger area.

A municipal electric plant, operated in connection with the city water works, for public purposes only, supplies the arc street lamps of Bangor, so that the general electrical supply system is not called on to provide for this service. Bangor also has a large electric street railway system, one of the pioneer plants in this line, having been started in operation on May 1, 1889. This railway is owned and operated by the same corporation that supplies current for private lighting and stationary motors, but the street cars are not as yet driven by the same generators on which the other parts of the system depend. The Public Works Company, with offices at 140 Park Street, Bangor, is the proprietor of the street railway and lighting systems just named. The Bangor plant of this company, consisting simply of a sub-station occupies the same building with its offices at the location just named, but its generating station is five miles above the city at a water-power on the Penobscot River. At this station, in the town of Veazie, a dam in the Penobscot, affords a working head on the turbines of 4 to 19 ft., according to the flow of the river in different seasons. So large is the amount of water available when the river is in its higher stages, that the head of 14 ft. yields about 1800 horse-power through the turbines. A small amount of this power is used for electric lighting in Veazie, and about 150 horse-power goes to pump the water supply of Veazie and Brewer. The remainder of this water-power is absorbed by the electric generators of the Public Works Company. These generators include those of direct-current type for 500-volt street car motors at Bangor, and on lines extending thence to Oldtown on the north and to Winterport on the south. Besides these street railway dynamos, there are alternators of high pressure, which supply energy to the sub-station in Bangor. Besides the turbines, the generating station is provided with a steam plant nearly equal in capacity to that of the water-wheels. The steam engines are used mainly as a reserve and during periods in the summer when the river is low.

Current is transmitted from the generating plant to the sub-station in Bangor by overhead wires on a line of poles following the general course of the river. Several years since a heavy sleet and wind storm prostrated several miles of this pole line, but the company had the wires up and lamps burning again at Bangor in a few days after the break. The construction of the transmission line is now so substantial that a break similar to the above is thought to be impossible. At Bangor the sub-station, a two-story brick building, is located just at one side of the main business district, and favorably for distribution purposes. At this sub-station, the high pressure, 60-cycle, alternating current from the water-power plant is received in transformers, and the voltage reduced to about 2000 for the local distribution lines that feed pole transformers near the premises of consumers. From these last named transformers, incandescent lamps are supplied at 110 volts, and also enclosed arcs on the same circuits. About 14,000 of these incandescent lamps are connected to the system as well as several hundred of the enclosed arcs. In order to provide for its stationary motor service another plan seemed more desirable. For this purpose a part of the high-pressure alternating current that reaches the sub-station is transformed to 550 instead of 2000 volts, and separate distribution lines at this lower pressure are run for motor service. By this practice a few large transformers at the sub-station do the work that would otherwise require a much larger number of smaller ones. The use of large transformers at the sub-station for the motor service at 550 volts saves the entire capacity in small transformers that would be necessary to supply motors from the 2000-volt lines, since the transformers at 550 volts take the place of both the small transformers and also of an equal capacity of transformers of 2000 volts at the secondaries. Because of the fluctuating character of motor loads, the aggregate capacity of small, local transformers for this service would be greater by a large per cent than the capacity now necessary in 550-volt transformers at the sub-station.

As the motors are distributed mainly over the business portion of the city, at moderate distances from the sub-station, the voltage of 550 is sufficient for a reasonable economy of copper. Incandescent lighting is conducted over a much larger area than the motor service, and the pressure of 2000 volts on its three-phase four-wire distribution lines is therefore desirable.

The compact business district of Bangor seems to offer an excellent opportunity for the use of a few large transformers on local three-wire lines, to displace small transformers for individual consumers. At present the transmission of power for the street railway, at 500 to 600 volts, must involve a comparatively large loss of energy and outlay of copper. In the future the abandonment of the direct-current railway generators and the substitution of rotary converters at the sub-station may be expected.

Rapid Telegraphy.

BY PATRICK B. DELANY.

THE comments on automatic, or rapid telegraphy, in your issue of Aug. 3, and the presentation made of the views of those opposed to such systems, invites a few criticisms. It seems strange that in drawing comparisons between the operation of the Morse and the automatic, Morse men, who must know better, invariably assume that the Morse wire is always clear, and the operator holding his key open for the next message to be handed to him, hence the argument that a message can be sent by key in the time that it takes to prepare it for automatic transmission. Nothing could be more misleading. The main delay between the handing in of the message at the window and its lodgment in the messenger's delivery book at the distant station is at the sending end, where it hangs on the operator's hook anywhere from one minute to an hour, according to the time of day and working condition of the lines.

Any one who has ever spent a week in a telegraph operating room knows this to be the case.

The average delay in transmission of messages by the Morse system throughout this country is over 30 minutes. This is the time they hang on the operators' hooks waiting their turn.

In times of serious interruption to lines four or five hours' delay is not unusual, and the train is not infrequently resorted to for avoidance of still greater detention. Telegraph companies provide wire capacity adequate for their traffic when all the wires are in good working order. They do not maintain reserve facilities for interruption contingencies. A day's rain over an area of two or three hundred miles causes a drop in carrying capacity of about one-third. Here is where messages accumulate on the operators' hooks to be culled out by the traffic clerk who decides from their contents which will bear the most delay.

The claim that a Morse operator can send a message while another operator is punching one is, of course, true, but when there are 20 messages on the Morse man's file the last one will be delayed about three-quarters of an hour. With the rapid system affording ample facilities under all circumstances so long as there is one wire left, no such accumulation could take place, and if all the wires were stopped the idle force could be employed in perforating, so that upon partial restoration of facilities, all business could be cleared out quickly, thereby avoiding delay to fresh business coming in for hours after full repairs had been made.

Now, with reference to the estimate of the time it takes a message to get from the sender to the receiver, obviously the time it takes to get it to the office, or the time used up by the messenger delivering it has nothing to do with systems of operation. It is true, the sum of the whole transaction is what interests the customer, but to assume that in practice, one minute, or one-sixtieth of the whole, covers the transmission period, is, as every telegraphist knows, as wrong as the Scotchman's conception of extravagance.

It is all well enough to point out the half-minute transactions between stock exchanges. No one disputes them. But what about the ordinary telegram? The receiver has no means of knowing when it was lodged at the distant office. The time of its reception around the corner is plainly shown, but the "6.15 p. m." lends no suspicion of the fact that the message was filed at its point of origin at 10.20 a. m. On the contrary it inferentially conduces to the con-

clusion that it is fresh from the pen of the sender. It is claimed that telegram time has been greatly shortened of late years, and I believe it to be so; but when the companies let the receiver know how long the message has been on the way it will be a great benefit to the public, and an honest transaction on the part of the company.

Until telegraph companies are compelled to follow the post office example in this respect the best tip to those using the telegraph would be to state the time in the body of the message and pay for it. It will have a wonderful effect, although the receiver may not be impressed with it.

In view of the fact that ordinary messages average about three-quarters of an hour from the filing window to the messenger's delivery book, and that during at least two-thirds of this time it is on the operator's table, it seems like straining at the gnat to dwell upon the time consumed in perforating and transcribing. Admitting that it may take from 5 to 20 minutes, according to the number of messages upon one tape, for these two operations, is it not better to get them off this way than let them hang on the Morse hooks?

Recently, owing to two notable improvements in printing telegraphs, perforation of messages on tapes, heretofore held by Morse managers to be so serious a drawback, has, I am glad to see, been recognized as an advantage, owing to the increased speed of transmission over the line. Up to this point, then, the rapid system and the printing systems are equally handicapped. The difference now lies in the fact that at the receiving end the message is printed, either directly by the receiving instrument, or as a secondary operation by using a received perforated tape to operate a type machine automatically. In the case of the rapid system the message is transcribed on an ordinary typewriting machine from the dot and dash tape by any one knowing the Morse code, and as fast as they can read and work the keys. Transcription in this way being a local operation, gives the operator the same control of the type machine as when working from printed matter or manuscript. It is neither difficult nor uncertain. Nearly all cable telegraphy is done in this way, and this is the most difficult and urgent of all telegraph working. The perforator used by the rapid system is worked by an ordinary Morse key, and the speed of transmission is at least 20 times greater than is possible by any printing system. Any Morse operator can perforate at his best speed, and any operator can transcribe. The working force of an office is instantly available for the new system.

The rapid will work over any kind of a line, any distance without repeaters—at a speed—and in its operation is simple compared with quadruplex outfits and their repeaters. It requires practically no adjustment, being within a wide range unaffected by changes in circuit conditions; and it affords at all times absolute certainty of communication, with facilities equal to any emergency. These advantages, impossible of attainment by any electromagnetic combination, are of paramount importance, and indispensable for reliable communication and low rates.

The official reports of economical managers show that the limit of cheapness has been reached with the present systems. It is also evident from these same statistics that the numbers of messages at present charges is about at a standstill—one per head per year—at 30 cents for 10 words. Telegraph managers have contended that there would be no economy in high speeds, no increase of business by lower tolls, that the telegraph is an emergency medium, and urgency cannot count the cost. It is strange that business men should argue this way. Examples are overwhelmingly against them. One will suffice just now. It is most apposite. Sunset methods in telephony have been moved eastward to Chicago to pull the "pay high or go without" policy out of a $5,000,000 deficit.

Canadian Water Powers.

There is another big power scheme which will soon be brought before the Provincial Parliament at Toronto, Ont. It aims to develop the water power northwest of the town of Port Arthur, Ont. The capitalists behind the scheme figure out that on the completion of the Canadian Northern Railway, Port Arthur will become a great flour milling center. They have in consequence set to work buying land for a canal 22 miles long to connect with and divert the Keministikuia River. There is said to be an easy route between the high levels to a point 3½ miles north of Port Arthur, where the syndicate proposes constructing a reservoir with an area of 1500 acres. When the route has been secured, it is not expected that much influence will be required to ensure the water power of the river in West Algoma being quietly conceded by the Ontario Government to a company.

Clark on the Conditions of American Telegraphy.

LAST March Mr. Thomas F. Clark, vice-president of the Western Union Telegraph Company, appeared before the United States Industrial Commission at Washington and testified in regard to the general conditions of the telegraph in this country and abroad, and its relation to the public. We gave a digest of Mr. Clark's interesting evidence the following week. It has now been printed by the Commission and issued in pamphlet form, accompanied by the two diagrams which we show here. It may be noted that the Western Union either directly or through telephone connections operated under arrangements therewith, reaches 29,000 places of 1000 people, or less, in the United States, while the total number of telegraph offices reached by telephone connection in the United States is 39,083. There are in the United States 76,000 post offices. As Great Britain has 10,816 telegraph offices and about 40,000 post offices, it appears that Western Union reaches practically 50 per cent of United States post offices, while only about 25 per cent of Great Britain's post offices have telegraphic communication. Telegraphic statistics of 22 foreign countries were presented by Mr. Clark, including all the leading countries of Europe, as well as Egypt and Algeria, and it is shown that the United States has two-thirds as many miles of wire as all these put together, or 41 per cent of the whole, and that it has 25 per cent of all the offices and sends 24 per cent of the messages.

On the important question of rates, Mr. Clark produces the interesting map here shown on a reduced scale, and now appearing for the first time, we believe, in a public journal. The general idea as to the method of fixing a telegraph rate has been vague, but Mr. Clark showed the scientific basis employed for local purposes all through the country. The Union is laid out in a system of squares, 50 miles to the square, and then the rate is made 25 cents from any square to any two circles of contiguous squares. Each side of each square is 50 miles. Within a radius of squares the rate is 25 cents. As the business has grown and localities have become more thickly settled, direct rates have been extended, and the square system has been overshadowed by the extension of the flat rate, as in the case of New England, where business and population justify it. The highest rate they charge is $1; that is, from the Atlantic Coast to the Pacific Coast.

All this telegraph business is on the 10-word count, with address and signature free. Then there is a system of night rates east of the Rocky Mountains; that is, for messages to be transmitted during the night and delivered the next morning at about half the day rate. But there is no rate less than 20 cents.

The press rates are made on a basis entirely their own, and because of the volume of business done and because the larger part of it is transmitted at night. The business of the press associations is largely done over leased wires. The Associated Press has a system of leased wires practically connecting all large centers of the country, which the association uses as it chooses and over which it sends all its business. The company has nothing to do with that system except to take the rental for the wires, the same as from any private individual. The press rate on matter that the company handles itself is made on a basis of circuits, by which a large number of papers can be served at the same time, so that economy to each paper can be promoted as much as possible, with due regard to the return to the telegraph company. The special rates to newspapers for a single transmission to one paper are based on "the additional word rate" of the day message; that is, one-third of the additional word rate in the day-time and one-sixth at night, so that where the rate is 25 and 2, the press rate in the daytime would be two-thirds of a cent, and at night it would be one-third of a cent a word for direct transmission and delivery to a single paper.

The Western Union Company also has rates for commercial reports which are distributed to exchanges and to various subscribers throughout the country. They are made on a basis somewhat similar to the press rates for individual subscribers, in that they name a rate for certain reports that may be desired, especially where they can be transmitted over circuits, so as to give the farmers and the dealers of produce in grain all obtainable information of the markets, in order to regulate the sale of their crops and the getting of them to market. Certain people may wish to have the opening and the noon and the closing reports of certain produce from certain exchanges, and those reports are made up and sent and delivered at those hours over certain circuits, as they are called for, through the rural districts.

The table shown herewith brings out the enormous distances over

which American telegraph service operates, as compared with the short distances within which any self-contained European system has to be operative. Enforcing this point, Mr. Clark presented two maps, contrasting areas on the same scale. The area of Switzerland is 15,981 square miles, or about one two-hundredths of the area of the United States. Belgium has an area of 11,373 square miles,

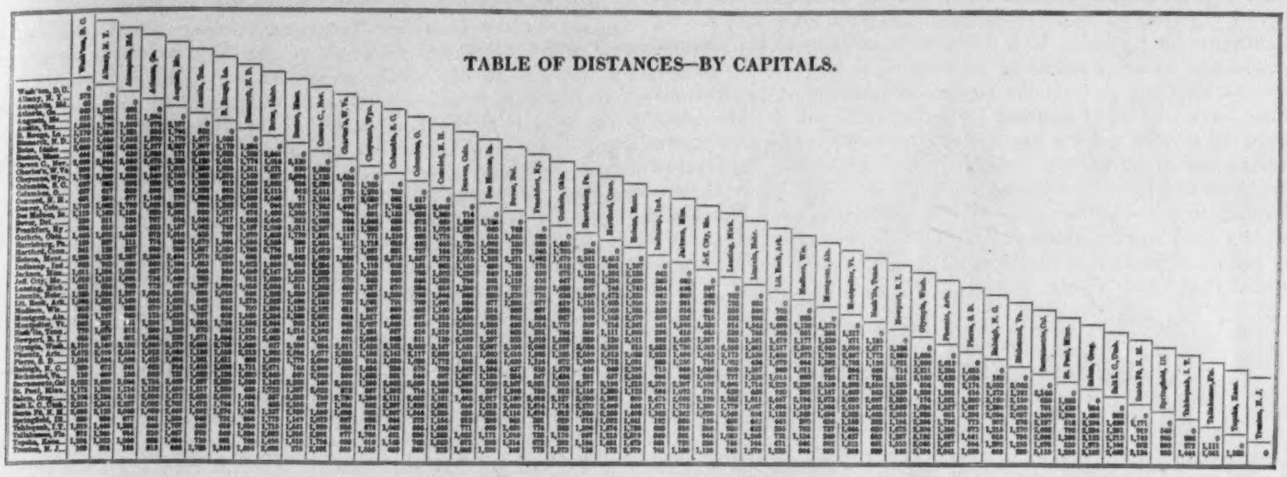


FIG. 1.—TABLE OF DISTANCES IN AMERICAN TELEGRAPHY.

which is one two-hundred-and-sixtieth the size of the United States. Great Britain and Ireland have 120,678 square miles, one twenty-fifth of the size of the United States; the area of the United States, exclusive of Alaska, being 3,092,679 square miles by the census.

In Great Britain the population is about 333 inhabitants to the square mile. In Belgium it is 586. In Switzerland it is 183. In the United States it is about 24. There are in Great Britain 308,436 miles of wire, or 43,507 miles of line. In Belgium 3964 miles of line and 20,752 miles of wire; in Switzerland, 4439 miles of line and 13,100 miles of wire. In the United States the Western Union Telegraph Company has 192,705 miles of line and 933,153 miles of wire. Of course, in addition to the Western Union Company, there are the Postal Telegraph Company and some subsidiary companies connected with it, adding 29,882 miles of line and 184,933 miles of wire, which makes altogether in the United States 222,587 miles of line against 425,600 miles of line in all Europe, according to the latest statistics of the international bureau at Berne, and 1,118,086 miles of wire in the United States as against 1,585,267 miles of wire in Europe. Now, comparing the mileage of wire to population, we have in America 1 mile of wire to 130 people in Great Britain and Ireland; 1 mile to 321 people in Belgium; 1 mile to 222 people in Switzerland, and about 1 mile of wire to about each 76 people in the United States.

It must be borne in mind that the system of the United States covers the whole country, reaches every important center from New York, on the Atlantic, to San Francisco, on the Pacific, and that in order to reach these places it is necessary for the wires to cover large unproductive territories, where the cost of construction has been exceedingly high and where the cost of maintenance is rela-

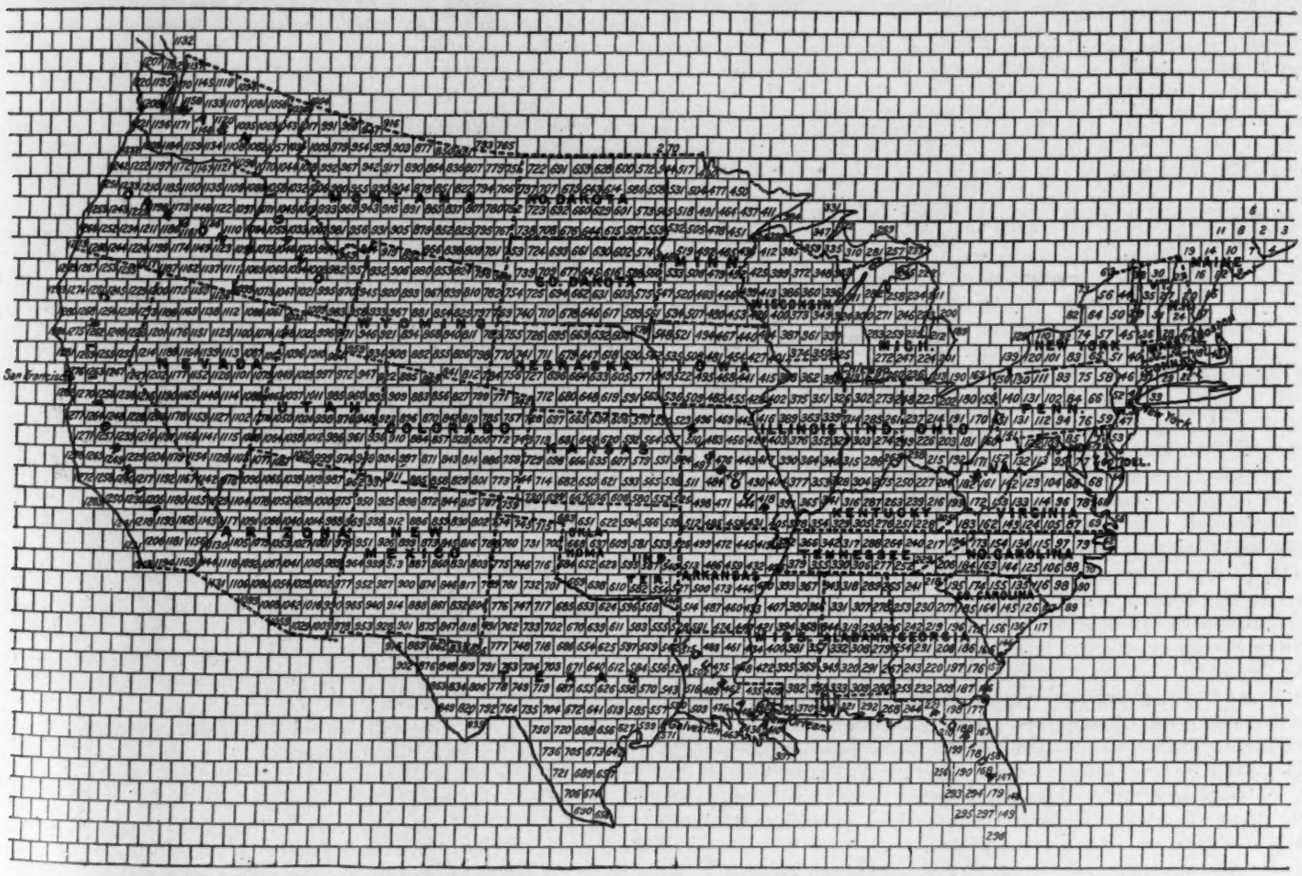


FIG. 2.—MAP SHOWING SYSTEM OF LOCAL TELEGRAPHIC RATES IN THE UNITED STATES BY THE SQUARE SYSTEM.

tively higher than it is in more thickly settled places. This is shown by the fact that of the Western Union Company's wires two-thirds, or about 600,000 miles of them, are in operation east of the Mississippi River, and one-third of the whole mileage is spread over the large unproductive territory west of the Mississippi in order to reach the small towns and camps and places along the various lines of railroads to the Pacific Coast. As a foil to these conditions, Mr. Clark quoted a statement made recently of the population surrounding Manchester, in England. In a radius of 10 miles there are 3,000,000 people, and within a radius of 50 miles there are 8,000,000 people. That is Manchester; what the population surrounding London and other large centers of England in similar radii will be, Mr. Clark could not say, but there is almost a case of confluence of populations, making really one densely settled territory, while his company had hundreds and sometimes thousands of miles of line where there is scarcely any business at all. In this and other ways Mr. Clark made a most striking exhibit in favor of the telegraphs as operated by private enterprise in America, when compared with the governmental systems of Europe.

The Nernst Lamp in Germany.

BY E. KILBURN SCOTT.

ON the occasion of the recent visit of the Institution of Electrical Engineers to the Lausanstrasse Station, Berlin, the Allgemeine Electricitats Gesellschaft gave an exhibition of the Nernst lamp, and a lecture on its development and construction was delivered by Herr Bussman, chief of the experimental department of the A. E. G. The lecturer's remarks, together with the experiments, convinced most of those present of the very great possibilities of the Nernst lamp. There is no doubt that great credit is due to those who have been working at the problem, in overcoming the various initial difficulties and in producing the lamp which has now an average life of 300 hours.

The method of applying initial heat to the filament by a small spiral wire of platinum and the cutting out of this resistance when the filament has been heated up sufficiently to make it a conductor is most ingeniously worked out from the point of view of manufacture cheaply and in quantity. In order to regulate the amount of current an iron wire resistance is placed in series. At a dull red heat the rate of increase of resistance of iron wire is so great per unit increase of temperature, that the corresponding decrease of resistance of the glower is compensated for, and the current passing is kept nearly constant. This wire is put in a vacuum bulb mounted on the lamp-holder. The difficulty of making a good contact between the platinum wire and the non-conducting filament appears to have been effectually overcome.

Hitherto the cost of manufacture has kept the new lamp from being a commercial success, and now this is in a fair way of being solved. In the A. E. G. works the lamps are extensively used, and they are also employed by many private consumers, to whom a rental of 75 cents per annum per lamp fixed is charged, there being nothing extra to pay for the renewal of the filament. To buy outright the price is $1.67, and 50 cents for each extra filament. The lamp is made for any voltage up to 250, and the fluctuation of pressure which has such a detrimental effect is taken care of by a special device in the latest type of lamp.

The pleasing effect of the lamps was abundantly manifest to all the members present, and the ladies seemed to be especially impressed by the fact that by gently blowing on the filament the light could be put out.

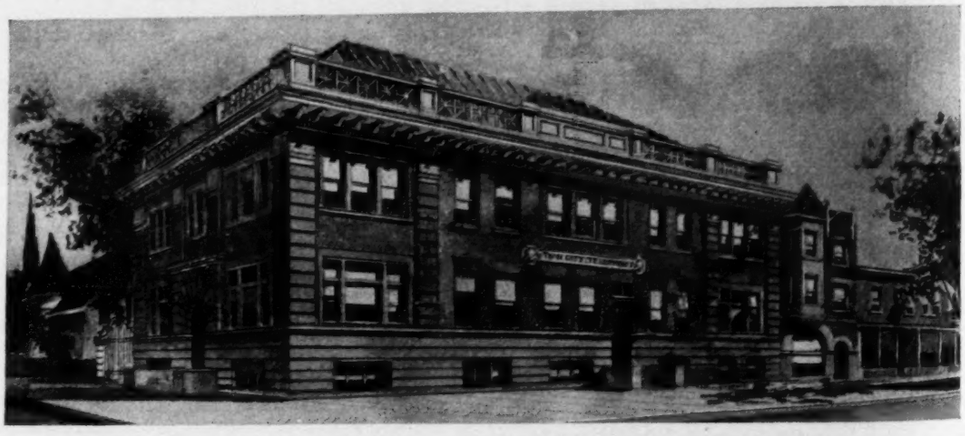
Of the economy of the lamp over an ordinary incandescent lamp the A. E. G. have now accumulated overwhelming evidence, as well as the very interesting fact that the efficiency of the lamp is maintained practically constant throughout its life.

New Telephone Exchange for Minneapolis.

We illustrate herewith the handsome new telephone exchange designed for the Twin City Telephone Company, of Minneapolis, by the Keith Company, architects, of that city, to whom we are indebted for the opportunity to present the view. It is, we believe, quite unique, there being no other exchange like it in the country. These splendid new headquarters of the Twin City Telephone Company are being erected on the corner of Third Avenue S. and Seventh Street, rather remote for disturbing trolley influences. The building will be of brick and stone, two stories in height, and with a half-basement. The frontage on Third Avenue will be 96¼ ft., and on Seventh Street, 50 ft.

The first floor will contain the offices of the general manager, the treasurer, the superintendent, the chief electrician, the contract department, counting room, instrument room, typewriters' room, vaults and lavatories. The second floor will be devoted to the operating room, switchboard, dining-room, parlor, lockers and lavatory. The operating room, which is to be 47 by 72 ft., will be constructed in accordance with all the most modern scientific improvements. The facilities for ventilating this room will be unsurpassed by any building in the country. A huge electric fan will force fresh air through a spray of water and then through cotton bags, thereby insuring a steady current of strained, cooled, purified air. This system is the same as that in vogue in the British Houses of Parliament. The rate at which the air will be admitted will be sufficient to make a complete change of the room's atmosphere every three minutes. In the winter the air will be heated to a comfortable temperature, and with such perfection there will be no necessity of opening the outside windows. It is of utmost importance that the operators have a large and constant supply of fresh air, as there will be at least 90 in the room at one time. Then, too, it is essential that no dust should get into the delicate instruments.

The basement, which will be 10 ft. in height, will contain the terminal board, relay racks, electrical machines, engine and boiler rooms, dynamo room, chief inspector's room, lavatories, lockers, storage room and a battery room, which will be the largest in the United States, with the exception of one now being built by a telephone company in Detroit.



Copyright, Keith Co., Architects. NEW TELEPHONE EXCHANGE IN MINNEAPOLIS.

The entire building will be electric lighted and steam heated. Throughout the plans the management has placed the health of its employes first, because it realizes that first-class service can only be expected from healthy and contented employes.

In a general way the work of the Twin City Company is nearly completed. It is stipulated in the central exchange contract that it be completed and ready for the installation of the switchboard and batteries within 60 days. The switchboard will have a capacity of 7200 subscribers. It is stated also that within 40 days the south exchange will be completely equipped and ready for business, also the east side exchange. The south exchange will cover all the great territory between the river and the lakes and south of Seventeenth

Street. Its ultimate capacity will be 3600 subscribers, and not less than 1000 telephones will be in operation this fall. The east side exchange will have a total capacity of 2000 subscribers. Every one of these telephone stations is a full metallic private line. The system is being installed by the Stromberg-Carlson Company, of Chicago.

Those Pan-American Flambeaus.

NATURAL GAS FLAMBEAUS.

It is a matter of regret to many who have admired the effects in illumination produced by the use of one uniform kind of light at the Pan-American Exposition to see now introduced on each side of the pylons a number of natural gas flambeaus, surmounting the posts along the lake, and originally designed exclusively for electric light. The effect of the sickly gas flame is not in harmony with the modern illuminant immediately beneath it on the same post. The night effect cannot well be truly shown by photography, but the unsightly appearance of the gas pipe by daylight, protruding its ugly length out of the top of the handsome post can be detected from the accompanying photograph. But night and day effects are such as to be convincing as to the contentions of Mr. Luther Stieringer in his article in these columns , July 20, 1901, on ground lighting at the Pan-American and prior expositions, in favor of a uniform scheme of illumination. In an exposition which typifies modern progress, an attempt to imitate in a cheap manner the crude illuminating methods of the ancients can only result as does this in bringing into prominence the beauty and grandeur of the modern method, but at the expense of the general effect.

Elements of Illumination—XXX.

BY DR. LOUIS BELL.

FOR purely decorative purposes the miniature lamps serve a very useful purpose. Regular incandescents are made down to 6 or even 4 candle-power, but as has already been explained, the filaments for these powers at ordinary voltages must needs be very slender and fragile, and the lamps are nearly or quite as bulky at those of ordinary candle-power.

Hence it is better to make miniature lamps for connection in series, each lamp taking 5 to 25 volts to bring it to normal candle-power. Imagine a 16-cp, 100-volt lamp filament cut into four equal parts, and each of these parts mounted in a separate small bulb, and you have a clear idea of the principle involved. Commonly the miniature lamps for circuits of 100 to 125 volts are of 5 or 6 candle-power, and connected five in series across the ordinary lighting mains. Fig. 1 gives an excellent idea of the size and appearance of the perfectly plain miniature lamp. It is fitted to a tiny socket of the same general construction as the standard sockets for ordinary lamps, but taking up so little room that the lamps can conveniently be assembled in almost any desired form.

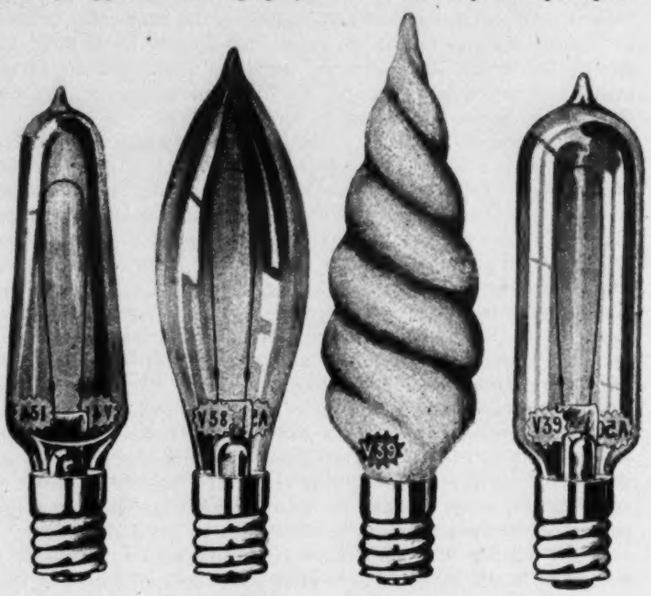
FIG. 1.—MINIATURE LAMP.

It is not altogether easy to manufacture these lamps so as to attain the uniformity necessary if the lamps are to be run in series, but, in fact, it is possible to obtain them of very good quality, and of length of life comparable with standard incandescents. They are generally not of high efficiency, since great uniformity and good life are the qualities most important.

They can be fitted with tiny ornamental shades, and may be obtained of various shapes and colors, so that very elaborate decorative designs can be built up of them. In indoor work colored lamps may be freely used, and are capable of producing some very beautiful effects, but the plain or ordinary frosted lamps are most generally used.

Owing to the small size of the sockets and fittings, the miniature lamps can be packed so closely as to produce the effect of an almost uniform line of light at comparatively small distances, so that most ornate schemes of ornamental illumination can be carried out by their aid. They are also very useful in building up small illuminated signs.

Lamps of special sizes and shapes from tiny ½-cp bulb, hardly bigger than a large pea, to the candle-shaped lamp of 5 or 6



FIGS. 2, 3, 4 AND 5.—LAMPS OF SPECIAL SHAPES FOR DECORATION.

candle-power are sometimes used with good effect in interior decoration. Figs. 2, 3, 4, 5 show some of the commoner shapes used for such purposes. When a regular electrical supply is not available these little lamps can be obtained for very moderate voltages, say, from 5 to 10 volts, and can be run in parallel from storage cells, or even from primary batteries for temporary use.

Such small lamps are sometimes used in the table decorations for banquets, and for kindred purposes. By their aid surprising and beautiful effects are attainable, which would be quite impossible with any flame illuminant. But they must be cautiously used, for their very facility tends to encourage their employment in effects more bizarre than artistic. It is well, too, to add a word of caution as regards the possible danger from fire. It is so easy to wire for incandescents that particularly when using miniature lamps there is a natural tendency to rush the work at the expense of safety. Lamps in series on a 110-volt circuit are quite capable of dangerous results if anything goes wrong, and even the battery lamps are not absolutely safe in the presence of inflammable material.

It should therefore be an invariable rule not to install a temporary decorative circuit without the same attention to detail that would be exercised in a temporary circuit of the ordinary incandescent. The same precautions are not always necessary, but all the wiring should be carefully done, joints should be fully protected and particularly lamps should be kept out of contact with inflammable material. The incandescent lamp is often commended as producing little heat, and, in fact, as compared with other illuminants, its heating power is small. But a vessel of water can be boiled by plunging an ordinary 16-cp lamp in it nearly up to the socket and cloth wrapped about such a lamp will infallibly be ignited within a comparatively short time. The fact that the cloth does not burst into flame in a few minutes does not indicate safety, for time is an important element in ignition, and even an overheated steam pipe is capable of setting a fire, low as its temperature is. A good many fires have been started in shop windows by hanging fabrics too near to incandescent lamps, and even the miniature lamps are quite capable of similar damage if in contact with anything easily inflamed. No illuminant has so high an efficiency that it produces a negligible amount of heat from the standpoint of fire risk.

In ordinary domestic illumination miniature lamps have very little place. Nothing is to be saved by using them so long as they must be used in series at ordinary voltages. Now and then a 4 or 6-cp lamp may be useful as a night lamp, but it is better to use an ordinary lamp

of moderate efficiency than to try miniature lamps. Sometimes a circuit of miniature lamps may be installed for a dining-room or ballroom with excellent artistic results. In such cases it is better to use ground than plain lamps, and, as a rule, colored lamps should be eschewed, on account of the impossibility of getting delicate tints to show effectively.

Temporary decorative circuits may, however, be very useful in domestic illumination for fetes and the like, in which case delicately colored ornamental shades can be applied, or the lamps may be used in Japanese lanterns or similar ways. Any country house fitted for electric lights can be temporarily wired for such purposes rather easily, and out-of-doors temporary wiring can be installed without the rigid precautions necessary indoors.

In all decorative lighting it is important to recognize the fact that illumination is a means to an artistic end, and not of itself the primary object. One is in these days of electric lighting far more likely to err by providing too much light than by failing to supply enough.

Great brilliancy is far less important than good distribution and freedom from glare. It is highly probable, for instance, that the effect of the illumination of the Electric Tower at the Pan-American Exposition would have been injured by the substitution of 32-cp lamps for the 8 candle-power actually used, and it is absolutely certain that a dozen arc lights, injudiciously placed would have detracted greatly from the harmonious result.

In interior illumination the same rule holds true. By the reckless use of brilliant radiants one can vary the vision up to a point where its power of appreciating values in illumination is almost entirely lost. In decorative lighting great care must be used not to approach this point, to leave the relief afforded by light and shade, and to realize the perspective in the details of the illumination.

In the absence of a foreground one's judgment of distances is completely upset, as witness the great difficulty experienced in estimating distances correctly over water on the one hand or in a thin fog on the other. In scenic illumination the distribution of luminous values can be utilized with great facility for producing illusions of distance, giving at will the effect of startling flatness or of interminable vistas. In stage illumination such devices are now and then used to heighten the effects, although other exigencies sometimes interfere with the proper development of the scheme.

The commonest cause of failure in proper illumination is the interpolation of a brilliant light between the spectator and the object to be viewed, with the inevitable result of losing detail and hurting the eyes. Brilliant diffused light is in this particular only less objectionable than direct light, and both should be assiduously avoided.

It must not be supposed that decorative lighting must necessarily be electric, since very beautiful results were attained before electric light was heard of, but electric lighting is unquestionably the most facile means of securing artistic results on a large scale.

A special department of lighting, peculiar to the electric branch of the art, is the use of the searchlight for scenic or utilitarian purposes. The searchlight is now a familiar object, consisting of a very powerful arc light, taking from 20 to 50 or more amperes, kept steadily by automatic focussing apparatus in the focus of a parabolic mirror, often with an auxiliary lens system. The material of the mirror is most often glass silvered on the surface, unless the parabolic surface is very deep, when silvered metal is generally employed. As the purpose of the searchlight is to give a parallel beam of light, the carbons between which the arc is formed are not in line, but staggered, as shown in Fig. 6, so that the crater of the arc points obliquely backward and the carbons are tilted so that this crater faces fairly the apex of the mirror instead of its aperture. An opaque disk between the arc and the mirror aperture cuts off all stray direct light so that all the light sent out is delivered from the mirror in a nearly parallel beam. The whole affair is mounted in a case having rotation about a horizontal and a vertical axis forming the familiar device shown as a whole in Fig. 7.

The mirror aperture may vary from a foot or so up to 4 or 5 ft., the searchlights most often used having from 2 to 3 ft. of aperture. The most perfect results are given by using a rather shallow parabolic mirror of silvered glass, which can be given a better and more permanent figure than a deep metallic mirror, and hence gives a beam more accurately parallel.

The searchlight, when properly constructed, will throw a dazzling beam many miles on a clear night, but in foggy weather or even in a comparatively thin haze its field of usefulness is greatly limited. It is of only casual use in ordinary forms of illumination, and its chief legitimate use is the illumination of special objects, in the manner already described in connection with the simpler reflector arcs. It is often abused by its application to advertising, and to a glaring and offensive simulation of daylight in places that have no need of it.

It is of considerable military and naval value, serving to detect movements of an enemy's troops or to pick up hostile vessels, but it is also of no small value in military signaling over long distances. For this purpose it is turned upwards upon the distant sky where its glare is visible in clear weather even up to a distance of 40 or 50

FIG. 6.—SEARCHLIGHT CARBONS.

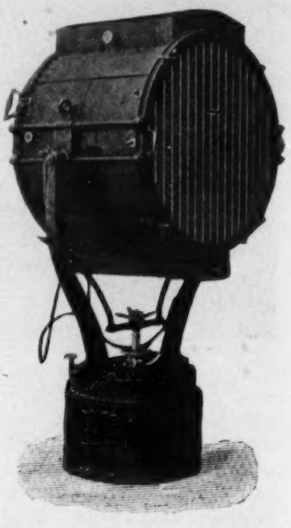


FIG. 7.—SEARCHLIGHT COMPLETE.

miles. Then, by deflections of the beam or by periodically cutting it off by a register shutter over the mirror, communication may be established by the regular Morse or heliographing code, either directly or in cipher. Its use in this fashion was especially striking during the recent operations for the relief of Kimberly.

It is also a valuable adjunct in coast defence, particularly of narrow channels and of mine fields, where it can be used both to confuse the hostile pilots and to make a clear target of hostile ships. But its range of effectiveness for such purposes is popularly much overestimated. In clear weather it would quite certainly pick up a large vessel by the time it had come within effective gun range. On torpedo boats and similar small craft, however, painted as they are for war in neutral tints, the searchlight has a useful scope of little over a mile in distance, and in hazy weather even less. It has therefore for naval, as for general purposes, a somewhat circumscribed field of usefulness, within which, however, it is undeniably of great value.

Power Development in Wisconsin.

The Black River Falls Company is making arrangements for the development of the water power at Black River Falls, 16 miles from West Superior, Wis. The development of the enormous power is now contingent upon the granting of a franchise to run wires and place poles in the alleys of the city.

The company owns 40 acres of land, and the plan is to put in a system of dams to increase the waterfall. The first dam to be built will be 25 ft. in height, and will back up the water to cover an area of 44 acres. This will be extended to the first reservoir, and the extreme depth of water in six reservoirs will be 15 ft. The falls themselves have a precipitate depth of 175 ft., so that with the dam the company will get a fall of 230 ft. in about 1500 ft., which would be at the distance from the first dam to the power house.

At certain times in the year there will be available nearly 25,000 horse-power. Several manufacturing concerns have already made application for power, but the main power will undoubtedly be used at the copper mines.

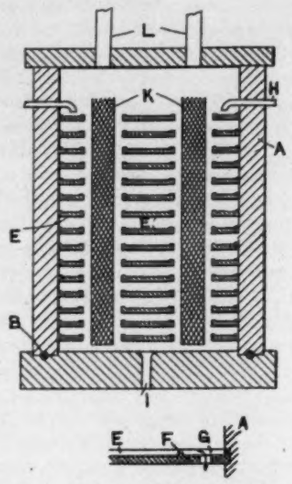
Red Indian Telephonists.

What is probably the only telephone system operated entirely by Indians is being installed in the village of Kish-Pie-Axe, in Northern British Columbia. The system is to be connected by a 20-mile telephone wire from the telegraph office at Hazelton, half way between Ashcroft and Atlin.

Modifications of the Mercury Cathode Electrolytic Cell.

Recent patent issues include several forms of electrolytic cell designed for the production of chlorine and caustic through the intermediary of a cathode of mercury. The respective patentees are Josiah W. Kynaston, of Liverpool, England; John F. Kelly, of Pittsfield, Mass.; Henry S. Anderson, of Springfield, Mass., and Brodde E. F. Rhodin, of Sault Ste. Marie, Canada, and their several cells, while quite different in form, are each designed to overcome a real defect in the type of apparatus now in commercial use. (See ELECTRICAL WORLD AND ENGINEER, June 8, 1901.)

Kynaston's purpose is to increase to the utmost degree the area of the mercury cathode. This he does by flanking a series of vertical carbon anodes by superposed horizontal trays, hollowed out to a uniform depth of ½ inch, to contain mercury, and communicating at alternate ends by openings whereby the mercury, fed continuously to the uppermost tray, may fall from each tray to that below and from the lowest to the cell floor, thence to be withdrawn, denuded of its sodium and returned. To insure a constant depth of mercury in the trays each opening is guarded by a narrow transverse dam, 3/8 inch in height. Accompanying Figs. 1 and 2 sufficiently indicate



FIGS. 1 AND 2.—KYNASTON CELL.

the construction of this device, *A* being the flagstone or slate walls of the cell with grooved and packed joints *B*, *K* the anodes, *LL* inlet and outlet pipes for the chloride solution serving likewise for the escape of chlorine, and *H*, *I*, the inlet and outlet, respectively, for the mercury. *EE* represent the stone or slate trays for the flowing cathode, channeled as described and provided with the dams *F* and openings *G*, as clearly shown in Fig. 2. The denuding apparatus, as patented to Kynaston in January of the current year, is substantially identical in form with this electrolizing cell, save that the carbons are replaced by rectangular boxes of stout iron wire gauze. These, in circuit with the amalgam in the trays, functioning in this case as anode, constitute, as is well known, a voltaic cell of considerable energy.

This construction affords a great increase in the cathode area, but the relative positions of the electrodes are such as would go far toward neutralizing any advantage to be derived therefrom. Such inequalities of current density as must follow so radical a departure from the simple rule of parallel working faces would be fatal to any operation of plating or refining, and it does not appear why less care should be exercised to secure proper current distribution over a cathode of mercury. The construction is, moreover, most unfavorable to the rapid withdrawal of the liberated chlorine from the neighborhood of the charged cathode. In these two respects the device would seem to present very serious defects.

In the rocking cell of the Castner type the sodium, although originally deposited upon the upper surface of the mercury cathode, becomes distributed throughout the body of the metal, less perhaps by simple diffusion than by the rolling motion attendant upon the flow of the mercury from the decomposing to the oxidizing chamber. This increases the time necessary for complete oxidation of the sodium in the latter compartment, and the purpose of the apparatus patented by Kelly is to prevent this intermingling of the amalgam and mercury by transferring the former as a supernatant layer upon the latter into the presence of water. The cell used is shown herewith (Fig. 3), comprising a stationary inverted bell *B*, supported by a suitable framework not shown, and containing a carbon anode *G*, pipes *D*, *E*, for admission and discharge of chloride solution, and duct *F* for escape of chlorine. The enclosing trough *A* is mounted upon a horizontal track *K* and provided with means *L*, *M*, for reciprocating it thereon. The mercury cathode *C* covers the bottom of this trough and operates in the usual manner as a seal between the

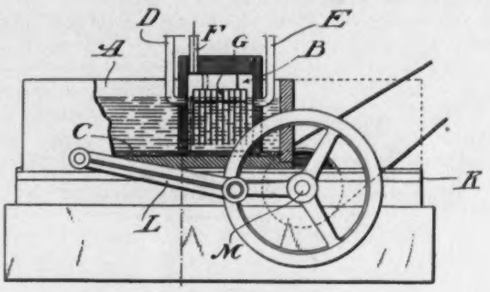
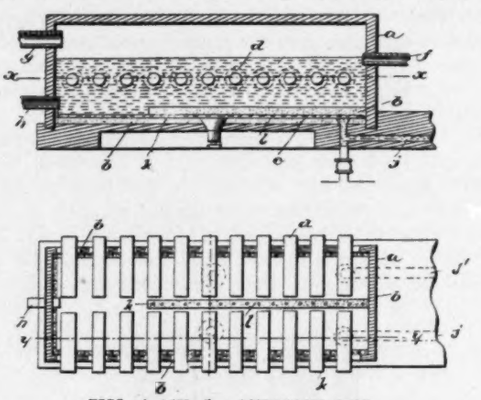


FIG. 3.—KELLY CELL.

brine in the inverted bell and the water in the external trough. In operation the slow horizontal movement of the trough carries the amalgam from the electrolytic cell to the combining chamber with the minimum of disturbance.

This idea is suggestive and perhaps valuable, but not new. The revolving compartment cells of Kellner and Rosenbaum accomplish the same result in substantially the same manner. The distinction lies in the reciprocation of the new cell with the consequent sharp arrest at the end of each stroke, of the heavy moving metal, and in certain undetailed advantages conceived to follow therefrom.

Anderson's object is to minimize the resolution of the deposited sodium by the electrolyte in the decomposing compartment of the cell—a reaction which gives rise to the formation of hypochlorites and is indirectly responsible for much disintegration of the carbons and for a dilution of the chlorine by carbon dioxide whereby its value for the preparation of bleaching powder is seriously diminished. Believing this troublesome oxidation of the sodium to be effected less by the main body of electrolyte overlying the mercury than by the thin film of liquid between the lower surface of the metal and the cell floor, he has devised a striking and original means for obviating the difficulty. Figs. 4 and 5 show Anderson's



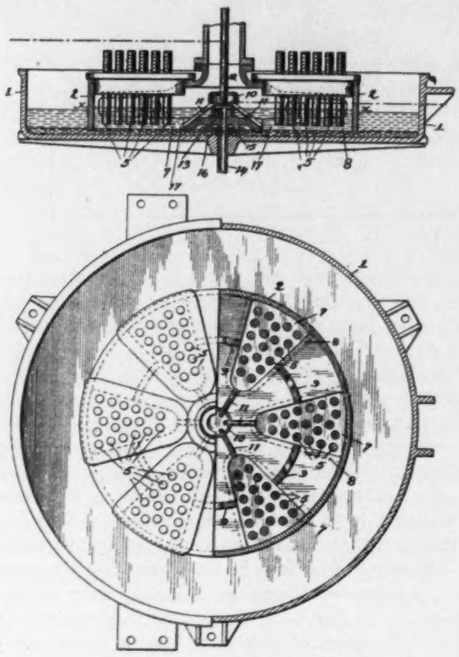
FIGS. 4 AND 5.—ANDERSON CELL.

modified cell in vertical and horizontal section, respectively, the general form being of the return flow type heretofore patented. The electrolizer is a closed chamber *a*, with inlet *f* and outlet *h* for electrolyte, and a gas eduction pipe *g*. Anodes *d* are laterally introduced, and the mercury cathode *c* entering at *j* and flowing around a central ridge *l*, passes at *j'* to the denuding apparatus. The novelty lies in the cell floor, which is a porous slab or plate *b*, preferably of pipe-clay, provided at the sides and center with flanges or extensions, rising to a height somewhat above the level of the mercury—the central extension forming the ridge *l* before referred to. These projecting portions of the slab are pierced by numerous vertical channels *k*. The effect of this construction is to give the electrolyte free access through the channels *k* and the substance of the porous bottom, to the under surfaces of the cathode, and therefore to establish with this surface an electrolytic connection sufficient to counterbalance, in effect, the solution pressure of the sodium.

No one conversant with cells of the Castner type can have failed

to remark the rapidity with which the floors roughen and disintegrate beneath the mercury. Presuming this to be due in large measure to the formation of caustic by inter-reaction of the sodium dissolved in the mercury and the moisture absorbed by the floors or trapped between them and the overlying fluid metals, it would seem that the remedy proposed—to conduct the current to the lower surface of the mercury and to thereby establish reducing conditions over its entire area—should prove an effective one.

The cell just patented to B. E. F. Rhodin and by him assigned to the American Alkali Company, of Camden, N. J., is the form, it is



FIGS. 6 AND 7.—RHODIN CELL.

understood, which has been adopted for the new installation at Sault Ste. Marie, Canada, and is a modification of the well-known revolving chambered cell invented by J. G. A. Rhodin, of Manchester, England. Figs. 6 and 7 show the general form of this apparatus, 1 representing an open iron tank for containing the mercury cathode and the water to oxidize the sodium, and 2 an inner revoluble cell of vitrified earthenware, carrying the anodes 5 and filled with the sodium chloride solution to be electrolized. The anodes are arranged as indicated in Fig. 7, in a number of distinct compartments 7, radially grouped, and each provided with a depending flange 8, dipping into the mercury and serving as a seal between the water and the brine. The electrolyte is introduced through the central pipe 12 into the cup 10, and passes thence by radial ducts 11 directly to the regions 17 of maximum decomposition beneath the anodes, the exhausted liquor escaping from the cell through the overflow

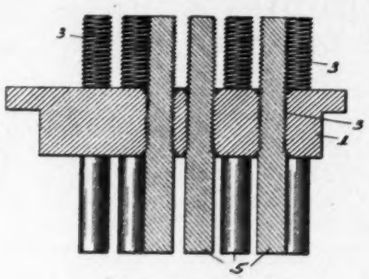


FIG. 8.—RHODIN ANODES.

13, 14. The annular groove and depending flange 15, 16, complete the separation between the liquids in the inner and outer vessels. The supports 9 are intended merely to guard against collapse of the cell during kiln-firing.

The anodes, as shown in section upon a larger scale in Fig. 8, comprise blocks 1 of graphitized carbon, flanged and fitted to the top of each electrolizing compartment 7, and carrying graphitized carbon rods 5, whose lower ends constitute the working anode faces. Block and rods are screw threaded, as shown at 3, to secure a close joint and at the same time to permit of longitudinal adjustment of the carbons to compensate for wear in use. In operation a slow movement of revolution of the bell 2 brings each surface portion of the mercury alternately under the anodes whereby it is charged with sodium, and into contact with water to effect its denudation, in a manner readily understood and familiar in earlier constructions.

This cell is the antithesis of Kynaston's, in that the object sought is a capability for the use of high current densities, thereby insuring a large output of caustic per unit of mercury. The earlier Rhodin cell has been notable in its attainment of this result, and the present modified construction, whereby is secured a sufficiency of concentrated electrolyte at the regions of maximum reaction, should make a further improvement.

The Electrical Hazard at the Pan-American.

Mr. H. K. Miller, general agent of the National Board of Fire Underwriters, in response to requests from a number of fire insurance companies for more definite information relative to the grounds of some criticisms by the board officials of the electrical conditions at the Pan-American Exposition, has sent out to underwriters a specific statement of defects, which was submitted to the board by Inspectors G. E. Bruen, E. A. Fitzgerald and J. C. Forsyth.

The transformers, in a majority of instances, are reported as being oil-filled and located in and underneath buildings and in close proximity to woodwork, so that there is a liability to overheating by short circuit and consequent ignition of the oil. The woodwork in and under the 11,000-volt transformer sub-station in the Elecricity Building is declared to be not fire-proof.

Link-fuse cut-outs are reported as not enclosed in fire-proof cabinets and as being surrounded by inflammable material, and in some cases the fuses are said to have been replaced by heavy copper wire. There is said to be a lack of proper support or protection for conductors from the power station entering the Electricity Building, and thence distributing through and underneath all of the principal buildings.

The general equipment of the power house is declared to be hazardous, exposing the structures of the Midway.

The inspectors conclude by saying that they regard these conditions as dangerous, adding that "there are also numerous minor defects throughout the Exposition buildings which, while not of sufficient importance to warrant specific mention, are of such a nature that trouble is likely to arise unless corrections are made."

CURRENT NEWS AND NOTES.

BAUXITE IN NEW SOUTH WALES.—The United States Consul at Sidney, N. S. W., reports that there are many large deposits of bauxite in New South Wales. Nothing in the shape of a systematic examination of the deposits has been made, however, but analysis shows that there is from 35 to 60 per cent of alumina in bauxite from different localities. With one exception the proportion of ferric oxide is large, ranging from 20 to 40 per cent, and silica from 3 to 35 per cent. All the deposits analyzed contain phosphoric and titanic acid.

CANADIAN CABLES.—The Department of Public Works at Ottawa has been advised that the government steamer "Tyrian," now at Gaspe, Que., has completed repairs to the cable between St. Paul's Island and Meat Cove, Cape Breton, which had been interrupted for some time past. The "Tyrian" has now left Gaspe for the purpose of laying the cable across the Strait of Belle Isle, which is to connect the Belle Isle station with the government telegraph system on the mainland of Labrador. By the end of August, the coast signal service will be in permanent operation to Belle Isle, which is a most important point on the summer route between European ports and the St. Lawrence. Steamships will, hereafter, be reported by telegraph 760 miles below the port of Quebec. This will mean that a 20-knot vessel, taking the summer course, can communicate her arrival on this side of the Atlantic in less than four days' out from Liverpool, England.

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WIRELESS FOR LABRADOR.—At the close of the Newfoundland Legislative sessions the Governor, Sir Cavendish Boyle, announced that the Marconi system of wireless telegraphy would soon be installed along the Labrador coast.

WIRELESS TELEGRAPHY FOR THE LAKES.—The superintendent of the Pere Marquette system announces that his company will soon install wireless telegraphy between Manitowoc and Ludington, over 156 miles of open water. Later on the Pere Marquette Company expects to equip all of its steamers with the system.

WIRELESS TELEGRAPHY.—A dispatch from Nantucket, Mass., of Aug. 14, says: Communication by wireless telegraph has been established between this island and South Shoal Lightship, and the system is working to the entire satisfaction of Commander J. D. J. Kelley, who has been in charge of the installation. Numerous messages have been exchanged between Siasconset and the lightship.

THE WANE OF THE OMNIBUS.—From financial statements recently issued by the operating companies, the passing of the London omnibus seems to be at hand. Electric trams and tube railways have diverted traffic away from the 'bus in a startling manner. The London Road Car Company has had to appropriate $12,500 from general reserve fund to pay a 3 per cent dividend, the lowest for a June half year in a decade, while the North Metropolitan Tramways Company, to make up its dividend to 4 per cent, had to take $50,000 from its reserves.

MORE STEAM ROAD TROLLEY.—Chicago & Great Western Railroad officials contemplate the installation of electric motive power for the road's suburban service as far south as Randolph, a distance of 30 miles. Estimates and plans for the proposed change from steam power have been prepared by the chief engineer, and he has already submitted two plans to the company, one calling for the third-rail system and the other for an overhead trolley with a return circuit. The Great Western has a heavy suburban business between St. Paul and Randolph and other suburbs within 30 miles of here. The rapid growth of the packing house industries in South St. Paul promises to swell the traffic to twice its present size, and the road is seeking more economical and effective means for handling its increased business.

A SIMPLE COULOMB INDICATOR.—A patent issued Aug. 13 to Samuel E. Doane describes a very simple form of coulomb meter for the indication of the relative amount of current used by two incandescent lamps connected in multiple. The apparatus consists of two glass tubes closed at the upper end, which may be entirely filled with a dilute solution of sulphuric acid, both of the tubes plunging into a common receptacle. Into the bottom of each tube extends a pair of thin, flat electrodes, one pair for each lamp to be compared. Mounted between the tubes is a scale, which, in the illustration, reads downward from zero to 150. When current is turned on the two lamps to be compared, which are in multiple, gas is electrolytically disengaged in each tube and rising to the top, depresses the level of the liquid. When this level in one tube reaches, say, the mark 100, current is turned off and the reading of the height of the liquid in the other tube will give the amount of current used in the second lamp as a percentage of that used by the lamp connected to the first tube.

GRAND CENTRAL TUNNEL.—In discussing the New York Central tunnel problem at the terminus in this city, the *Railroad Gazette*, a well-known authority in its field, treating the subject from the railway point of view, says: "We do not feel at all sure that, up to the present time, the actual 'state of the art' would have made it practicable to do materially better than has been done. Now, however, the development of the art of electric traction and of the art of ventilating long tunnels appears to have reached a state where radical improvement is not only possible, but practicable. The improvement of the tunnel may be made along two lines. It may be ventilated or it may be worked by motors which make no smoke or gas. * * * We guess that it will not be a ventilation plan at all, but a plan which will get rid of possibly 80 per cent of the products of combustion; possibly of all of them. The suburban zone will be electrified. All local trains, serving that zone, will be replaced by electric trains. Each of these latter will be a motor car and a trailer in the middle of the day, and longer trains will be built up by multiples of these, for the busy hours."

MUNICIPAL ELECTRICIANS.—For the International Association of Municipal Electricians, at its sixth annual convention, Niagara Falls, Sept. 2, 3 and 4, the following programme for entertainment for the members and guests has been arranged by M. J. Donohue, chairman of the executive committee: Monday afternoon, Sept. 2, carriage ride for the ladies through Island Park. Monday evening, trolley ride over gorge railroad, with electric searchlight effects. Tuesday afternoon, Sept. 3, excursion "Maid of the Mist." Tuesday evening, reception and hop at International Hotel, the headquarters. Wednesday afternoon, visit to Niagara Falls electric light station and power house. That day the convention will adjourn and the delegates and guests will visit the Pan-American Exhibition at Buffalo on Thursday, Friday and Saturday. President McFarland, of the Old-Time Telegraphers' Association, has arranged for one fare for round trip excursion from Toronto to Montreal for all those who wish to attend the Old-Timers' and U. S. Telegraph convention at Montreal the following week.

SELENIUM TELEPHONY.—It is well known that a selenium cell when continually exposed to the action of light will decrease in sensitiveness, its resistance not varying in accordance with the intensity of the light thrown on it, and that if exposed too long the resistance becomes practically constant. To obviate this objection is the object of a patent granted Aug. 13 to Joseph Poliakoff, of Charlottenburg, Germany, which also describes an apparatus for photo-telephony. Two independent selenium cells are used, and by means of a mirror on a vibrating lever the working beam of light is thrown alternately on the two cells, which are separated by a partition. The telephone circuit is simultaneously changed from one cell to the other by means of the same vibrating lever, or an arrangement of condensers employed with the two cells arranged in multiple in the telephone circuit. With the arrangement shown, a photographic sound record is obtained by passing a sensitized ribbon past a slot, where it is exposed to light, whose vibrations are varied by a polished diaphragm spoken to. This negative is developed and a positive made from it which is fed at the same rate past the same slot; a beam of light is passed through the ribbon to the vibrating mirror, and the resulting waves of varying intensity are then reflected to the cells and sound thus transmitted to a distant receiver.

PATENT OFFICE "SAFEGUARDS."—Edwin V. Shepard, chief clerk of the Patent Office, in a recent paper on "Safeguards," discusses the means that are taken to prevent the disclosure of inventions and the loss of papers and remittances after they have been given into the custody of the Patent Office. To remove all temptation on the part of an employe to make use of any idea suggested to him by any paper filed; to prevent even his unconsciously absorbing an idea and later innocently developing the same idea as his own —a section of the Revised Statutes prohibits the grant of a patent to an officer or employe of the Patent Office. The office does its best to employ only reliable men and women, and so complete is the system of records within the office that it can be told to a certainty who has handled any particular case up to its date of issue, so that detection would almost surely follow disclosure, and the likelihood of any wrong on the part of the office force is thus reduced to a minimum. The loss of papers is effectually guarded against by the system of charges, a paper taken from a division or sent there for report being charged, so that an examination of the slip shows where to look for the missing paper. As a further precaution the waste paper of the office is examined every night and the windows of the file rooms are all screened. When a paper is pronounced "lost," the "official searcher" is armed with authority by the Commissioner of Patents to look in every possible place and all desk drawers and other places generally regarded as private must be thrown open for his inspection. No losses of remittances can occur, Mr. Shepard says, after the first entry has been made on the books of the office. The principal losses occur in transmission, the reports of the office showing that about one letter in 2000 in the ordinary mail is reported missing, and about one letter in 10,000 in the registered mail, which means an average of only three or four complaints a week received by the Patent Office.

TRADE RECIPROCITY.—President Search, of the National Association of Manufacturers, has called a meeting of the executive committee of that organization at Philadelphia for Sept. 4 for the purpose of taking up the question of reciprocity. The subject will be considered in all its phases. A call will then be issued for a national reciprocity convention. Congress, at its next session, will be asked to give the desired relief. The sentiment of the manufacturers, Mr. Search says, is in favor of securing treaties of commercial reciprocity with other countries. Within the past few months, he says, Russia, Italy and some other countries have dealt heavy blows to our foreign trade by the levying of countervailing duties. An attempt will be made to show Congress that American industries have suffered by the present tariff laws and their interpretations.

THE ROTATING CATHODE FOR ELECTRO-DEPOSITION.—Cowper-Coles has just patented a modification of his oft-described apparatus for obtaining tough and smooth deposits of metal upon a rapidly revolving cathode, the improvement lying in the use as motive agent of a jet of the electrolyte itself, impinging upon a wheel of the Pelton type, secured to the top of the revolving mandrel which constitutes the cathode. To prevent the electrolyte from developing a movement of rotation with the cathode and thereby diminishing the surface friction relied upon to burnish the deposit, the anodes are arranged around the mandrel in the form of an annular grid of radiating bars, which act as baffles as regards movement of the liquid. A circumferential speed of 1000 ft. per minute insures the instant detachment of hydrogen bubbles and permits the use of extremely high current densities. Mr. Henry Wilde, one of the pioneers of electro-metallurgy, has warmly contested the Cowper-Coles claims to originality as regards the invention of the spinning cathode, pointing to patents of his own of nearly 20 years' standing. The modified construction, however, is distinctly novel.

WORKSHOPS IN ENGINEERING EDUCATION.—Mr. R. D. Summerfield, writing in our London contemporary, *Electrical Engineer*, expresses the opinion that to provide a workshop for a technical school is a simple waste of money; that it is not only useless, but in many cases actually harmful, as the students have to unlearn much of what they were taught there when they become connected with an engineering concern. It is quite right, he considers, to have laboratories, and such plant as a boiler, steam engine, pump, dynamo, etc., on which tests for horse-power, steam and fuel consumption, efficiency, etc., may be carried out by the students, as such tests are probably the most important part of the school teaching, if they are carefully carried out, and the value of the results clearly and fully pointed out by the teacher; but to fit up a workshop in imitation of an engineer's shop, and to set the students to make small engines, lathes, etc., he pronounces to be little less than a farce, as far as such training is of any use to them in after life. The work turned out of these college workshops, he adds, is often very well done, but it is done with no regard to time or cost; the students spend hours in filing up two or three nuts or in polishing surfaces which would be better left unpolished, etc. The consequence is that when they leave school and go into an engineering works, where economy in production is considered of the first importance, and the theoretically best form of any machine can only be approximated to for good practical reasons, they have quickly to unlearn the out-of-date method of working taught in the school workshop, and they will usually not be long in coming to the conclusion that the time spent there was, to say the least, wasted.

REGULATING ALTERNATORS.—A patent granted Aug. 13 to Harold Edwards describes several methods for compensating the objectionable effect due to variations in the speed of alternators, all of the methods depending upon the use of an induction motor as the principal regulating device. In one arrangement the induction motor rotor is mounted on the shaft of the alternator to be regulated, and with its inducing circuits connected to a small auxiliary three-phase alternator which is driven at constant speed. In series with each of the three loads between the motor and auxiliary generator is a transformer. The secondaries of the three transformers are connected to one side of a rectifier driven by the auxiliary machine, the other side being connected with an auxiliary winding on the alternator to be regulated. When the speed of the main and auxiliary generators is identical, a comparatively small current only will pass through the transformers. If, however, the main machine drops in speed, the induction motor will fall out of synchronism with the auxiliary machine, whereupon current flows from the latter to the induction motor, the amount of which will depend upon the deviation in speed. E. m. f.'s of corresponding value will be set up in the transformer secondaries and the rectifier will deliver a corresponding direct current to the regulating field winding of the main machine. Should, however, the main machine rise in speed above the normal, a direct current of opposite sign will be delivered. In another arrangement the auxiliary alternator is dispensed with and the induction motor is driven at constant speed. In a third arrangement the rectifier is dispensed with and alternating regulating currents supplied to a Rice compensating winding.

PAN-AMERICAN EXPOSITION SEARCHLIGHT SIGNALS TO TORONTO.—Signals from 30-inch searchlight, on the Electric Tower of the Pan-American Exposition, were sent to Niagara Falls, July 25, by Professor George F. Sever, superintendent of Electrical Exhibits, in the presence of the electrical jury, thus again demonstrating the feasibility of this method of signaling at night. Since that time searchlight signals have been sent from Buffalo to Toronto, a distance of 58 miles, through arrangements completed by Professor Sever in co-operation with Mr. William S. Aldrich, consulting electrical engineer, of Toronto. The first trial was made, 9 to 10 p. m., Aug. 9, with clouds over Toronto. The local illumination of the overhead sky by the electric arc lights in the streets of Toronto effectually prevented any discrimination being made between the local and the Buffalo illumination of the clouds. The second trial was made 9.50 to 10.15 p. m., Aug. 13, with a perfectly clear atmosphere. Owing to the smoke settling down over the city no signals could be discerned from the top of the Municipal Hall tower, Toronto, but all of these signals were very clearly discerned during this trial by Mr. C. H. Rust, city engineer, Toronto, with a party located on Centre Island, two miles off shore from the city. Special long-distance communication was arranged between the top of the tower and the Electric Tower, at the Pan-American, through the courtesy of the Bell Telephone Company, represented by Mr. Dunstan, of Toronto, so that every detail of the experiment could be followed. The special instructions were to depress the searchlight to the lake horizon, bearing on the Municipal Hall tower, Toronto, then to sweep the horizon a definite angle, to the right and left of this bearing, and later to elevate and depress the light on the original bearing.

PIPERIDIN BY ELECTROLYTIC REDUCTION.—Piperidin, a powerful stimulant well-known to the medical profession, and one of the series of strong aromatic bases originally prepared from black pepper, has of later years been synthetically produced by the reduction by means of sodium in alcoholic solution, of the base pyridin, a constituent of Dippel's oil and the type of those medicinal agents, powerful for good or ill, known collectively as the "alkaloids." Pyridin is a compound bearing a general structural relation to benzene, but differing in the substitution of nitrogen for one of the triad groups, CH'''. Piperidin differs from pyridin in that it contains six additional hydrogen atoms, and is easily prepared by subjecting pyridin in acid solution to strong reduction. The reaction is therefore typical of many to which the electric current, with its ease of control, and freedom from by-products, has been so successfully applied, and it is not surprising to note that this reaction, too, has fallen under the domain of electro-chemistry. The conditions under which the electrolytic reduction of pyridin best proceeds were first studied by Ahrens who stated that 95 per cent of the theoretical yield could be obtained by employing a cathode solution of pyridin dissolved in 10 times its weight of 10 per cent sulphuric acid, an anode solution of dilute acid and electrodes of lead. This high claim seems, however, not to have been fully warranted, for the method never passed into commercial use, and now Wilhelm Pip, of Darmstadt, in reviewing the entire subject of the electrolytic reaction, finds the conditions under which the best results are attained to be quite different. They are thus formulated by him: The sulphuric acid must be strictly pure, and must be present in the proportion of at least three equivalents to one of pyridin, or largely in excess of the quantity specified by Ahrens; the electrodes may be of lead, silver, mercury or carbon, but not of platinum; the diaphragm must be carefully freed from traces of salts of metals other than those specified above. The Ahrens process, restricted to these essential conditions, patented to Pip and assigned to the firm of E. Merck, of Darmstadt, has doubtless now entered upon its commercial life.

LIGHT RAILWAYS FOR INDIA.—Lord George Hamilton, English Secretary of State for India, stated last week in regard to that country that it was the Indian Government's intention to appoint a trained expert to assist the Government in developing the railways of India on the most modern practical lines. This expert would immediately visit the United States, and would prepare an exhaustive report upon the railway system there, especially concerning light railways, with a view to determining how far the American system would be applicable to conditions in India. The rapid extension of country trolley systems here thus appears to have attracted attention in India as well as elsewhere.

LETTER TO THE EDITORS.

"Moblodge."

To the Editors of Electrical World and Engineer:

Sirs.—In your Aug. 3 issue, p. 185, London asks for a correct word for a private collection of automobiles equivalent to "stable," as referring to a number of horses. As "stable" is defined as "a lodging place for beasts," why not use the word "moblodge," a lodging place for automobiles?

GROSVENORSDALE, CONN. MYRON A. DARBIE.

DIGEST
OF
CURRENT ELECTRICAL LITERATURE.

DYNAMOS, MOTORS AND TRANSFORMERS.

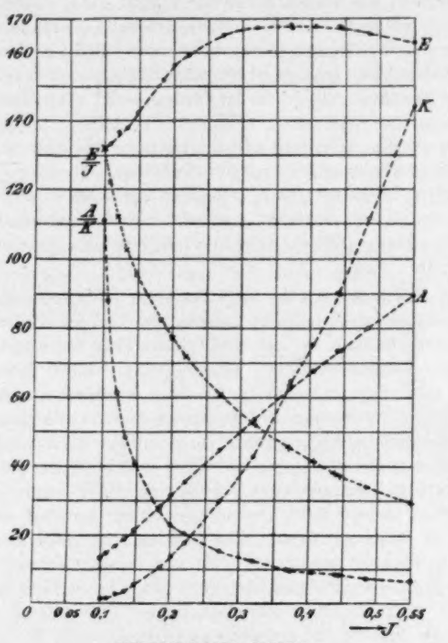
Three-Phase Induction Motor.—TRYLSKI.—A well illustrated description of large three-phase induction motors which have been made by the Alioth Company for a French plant, where they are direct connected to compressors which compress air from 6 kilograms per square centimeter to 100 kilograms for traction purposes. Each motor has a normal power of 500 horse-power at 100 revolutions, the voltage being 5000 and the frequency 25. At a load of 500 horse-power the current is 50 amperes, the efficiency 92 per cent, the power factor 0.93, the slip 3 per cent. For a load of 1100 horse-power the motors fall out of step. The efficiency is 90 per cent for 160 horse-power, increases to 93 per cent at 370 horse-power and then decreases slightly.—*Elek. Zeit.*, July 4.

REFERENCE.

Stray Field in Induction Motor Armatures.—LA COUR.—Some critical remarks of purely theoretical interest on some points in a recent paper of Niethammer.—*Elek. Zeit.*, July 4.

LIGHTS AND LIGHTING.

Commercial Nernst Lamps.—WEDDING.—An illustrated account of what seems to have been an extended series of tests of commercial Nernst lamps of the Gen. Elec. Co., of Berlin. The first purpose of the tests was to control the correctness of the numerical values, given by the company. They were found to be correct. The time required for heating the incandescent body was found to be about 30 seconds or less. From his experiments he concludes that the lamp can be further developed so as to consume only about one watt per candle. In several lamps this has already been nearly accomplished. He then gives the results of extended photometric tests in several tables and 12 diagrams. For a suspended Nernst lamp with horizontal filament and clear glass globe for 220 volts and 0.184 ampere he found a mean illumination of 17.6 c. in a vertical plane above the horizontal plane, 26.5 c. below the horizontal plane, and 19.7 c. in the horizontal plane. In another suspended lamp with vertical filament for 220 volts, he found the lower hemispheric candle-power 108.4 candles for a lamp without a globe and 91.3 candles for a lamp with globe, hence the globe causes a decrease of the candle-power in the lower hemisphere by 15.8 per cent. For determining the absorption of the ground glass globe and the mean spherical intensity, he tested a lamp for 220 volts, 0.88 ampere, 150 candles; without globe the mean illumination for the lower hemisphere was 110.3 candles, for the upper hemisphere 96 candles, for the total sphere 103.1 candles; with globe the mean illumination for the lower hemisphere was 93.6 candles, for the upper hemisphere 83.4 candles, and for the total sphere 88.5 candles. A comparison of the Nernst lamp with the carbon filament incandescent lamp shows that the consumption in watts per spherical illumination in candles of the former to the latter is as 1 to 2.1. He then gives a very interesting account of an investigation of the behavior of an incandescent filament under various voltages. The main results are given in the adjoining dilagram. The abscissas J represent the current in amperes, the curve E is the voltage, K the candle-power, A the watts, $E \div J$ the apparent resistance, $A \div K$ the power consumption in watt per candle. The normal voltage is 165. The E curve has a maximum of 168 volts for an abscissa 0.38 amperes. This is very important, as it represents a critical value. Should this critical value be exceeded during a variation of voltage, then the filament would no longer consume 0.27 ampere, but 0.51 ampere at 165 volts, i. e., nearly double the previous current. It would not be able to stand this high current for a long time, and would soon be destroyed. It is therefore necessary that an auxiliary resistance be placed in series with the filament, and its action must be to keep the current constant. That this is fulfilled by the resistance used in series with the commercial Nernst lamps, is shown in a curve. He finally gives the results of photometric tests in which a 192.5-watt lamp was suspended at three different heights—



NERNST LAMP CURVES.

2.5, 3 and 4 meters—above a horizontal plane. The distribution of the illumination of this plane was investigated. The maximum illumination is 1.25, 1.5 and 2 meters distant from the point exactly perpendicular below the lamp, when the lamp is 2.5, 3 or 4 meters above the plane, respectively. The illumination of the horizontal plane is much more uniform, the higher the lamp is above it. When two lamps are placed at a distance of 12 meters both 4 meters above a horizontal plane, the point of the plane in the center between the two lamps has an illumination of two candles, while the maximum illumination is three candles. The distribution of the light thus becomes quite uniform. It can be still more improved with the aid of a reflector.—*Elek. Zeit.*, Aug. 1.

POWER.

REFERENCE.

The Practical Application of Superheated Steam.—HUTCHINSON.—An abstract from a paper read by the author at the Milwaukee meeting of the American Society of Mech. Engineers.—*Am. Elec.*, Aug.

TRACTION.

High-Speed Electric Traction Between Milan and the Italian Lakes.—The many available water powers in Northern Italy have led the steam railroad companies of that district for some years to contemplate the transformation of many of their shorter lines into electric systems. The latest development of this kind is the line running between Milan and the Italian lakes, the road being some 73 km. in length, and obtaining power from a hydraulic central station at Tornavento. The Government has placed all the water power at the disposal of the railroads so that no other companies can be formed for its development until the railroads have decided that they do not need certain portions of it. The development of the water power at Tornavento will be sufficient to operate the new line throughout its whole length, five sub-stations having been constructed to transform the high-tension alternating current at which the electricity is generated into the ordinary direct current at 600 to 650 volts that is used on the line. The road is to be of the third-rail type, and two-car trains will be operated, consisting of a motor car and trailer, during periods of heavy traffic, the motor car alone being used at other times. The hydraulic station has not yet been completed, but a steam plant has been constructed immediately adjoining the site of the hydraulic station, which will supply current until the latter's completion and will afterwards be held in reserve as an auxiliary station. The alternators have a normal output of 760 kilowatts each, with a non-inductive load, and will stand an overload of 25 per cent for two hours and 40 per cent instantaneously. They are of the three-phase revolving field type, and generate 13,000 volts directly. The transmission lines running to the sub-stations are all in duplicate, being run ordinarily in parallel. A schedule has been prepared which provides for a remarkably efficient service. The sub-stations, of which there are five, are equipped with air blast transformers of 180 kilowatts normal output each, which reduce the high-tension voltage of 12,000 volts to 420 volts. This is then passed through reactive coils and rotary converters, where it is transformed to direct current at a tension of 650 volts. The direct current is taken directly to the third rail, no feeders being used. The conductivity of the rail is as 1 to 11, as compared with that of pure copper. At one of the sub-stations a battery of accumulators has been installed and a motor-driven booster inserted for charging. The cars are equipped with four 160-hp motors, which develop sufficient power to run the cars at about 96 km. per hour, a speed which it is necessary to attain in order to comply with the schedule laid out.—*St. R'y Jour.*, Aug. 3, and Inter. Ed., Aug.

Electric Railways of Ohio.—Davis.—An elaborate map showing the electric railway lines in operation, those under construction and the projected roads in the State of Ohio. This State now has about 9000 miles of steam roads in operation. At present there are about 900 miles of electric railways in the cities and towns, and nearly the same length of interurban and suburban lines, while those in actual process of construction aggregate 1435 miles. New roads are constantly being organized, some of which will be built, but many not. The interurban lines are usually built over their own right of way, and the more conservative and successful are satisfied with a speed of about 35 miles per hour. The feeling that these roads will be largely competitive for traffic with the steam railroads is not so strong as it was, as many of the trunk lines are willing to allow the local traffic to go over the suburban lines. The shorter steam lines, however, are feeling the competition in traffic.—*St. R'y Jour.*, Aug. 3, and Int. Ed., Aug.

Atlanta Rapid Transit Company.—The lines of this company are operated by power obtained from the electric light plant of the Georgia Electric Light Company. The current is generated by alternators and transformed by rotary converters at the lighting station and at a sub-station. Within certain districts, known as the fire limits, the feeders are placed underground in conduits, but outside these districts they are supported on the poles. The overhead trolley is used throughout and both wooden and iron poles are employed. —*St. R'y Jour.*, Aug. 3, and Int. Ed., Aug.

Toledo and Monroe Railway.—Conant.—A description of this high-speed electric railway, 18 miles in length, forming a link between Toledo and Detroit. The power is distributed by the three-phase system with rotary sub-staions. There is at present one 400-kw three-phase alternator. There are two sets of bus-bars on the switchboard connected by switches so that the generator can supply either set of bus-bars. The high-potential bus-bars connect with three auto converters, which add 20 volts to the initial e. m. f. of the generator. The transformers are directly above the switchboard. The sub-station is 12 miles distant from the power station. The railway poles also carry the high-tension transmission wires. A barbed wire is carried along the tops of the poles and grounded at every fifth pole to the rail, and also to a tinned copper plate buried 5 ft. in the ground. Telephone wire is also carried on iron brackets attached to the poles.—*St. R'y Jour.*, Aug. 3, and Int. Ed., Aug. (See Electrical World and Engineer, Aug. 3.)

The Naples-Aversa-Caivano Interurban Electric Railway System. —Pio.—A description of this road, which was opened on April 1, and presents many interesting features. The price of coal in Naples is high, and it was important that the loss in transmission should be reduced as much as possible. Three-phase high-tension current is used between the single power station at Naples, and a sub-station located near Melito, the only one so far built. When the service requires it, a sub-station will be erected at Afragola. The present installation in the power staion consists of three steam engines of 350 horse-power each, directly connected to the generators. These consist of one 5000-volt alternator and one direct-current railway generator, which are in regular service, and to the third engine are connected duplicates of both machines, so that this engine could be used in an emergency to supply either direct or alternating current. The transmission line is supported on the same iron poles as the trolley wire, and is attached to the poles by clamps. Each section between poles is separate, and if the wire breaks the clamps immediately release the two pieces in that section, allowing them to fall to the ground and preventing danger from live wires. The rolling stock consists of 10 Rutelli cars, seating 52 persons each, and about 11 meters long. They will be operated with three or four trailer cars.—*St. R'y Jour.*, Aug. 3, and Int. Ed., Aug.

Canal Traction.—Fabre.—A brief article on a new monorail electric system of canal traction devised by Fabre. The tractor runs on the towpath and hauls the canal boats. The tractor is provided with four oblique driving wheels, running on the monorail. The entire tractor can oscillate around the circular-shaped rail as an axis. On the canal side a supporting wheel keeps the tractor upright. The electric motor sets the driving wheels in motion by means of worm or conical gears. He claims that his arrangement enables him to use very light tractors. In the application of this system, which is to be made in France, three-phase currents will be used, the rail being taken as a conductor. "Two normal speeds will be available with only one motor, a three-phase motor running at half-speed when two phases of its secondary are open circuited."—*Elec. Rev.*, Aug. 10.

The New York Central Tunnel Problem.—Louis Bell.—A discussion of the question of the handling of the cars in the N. Y. Central tunnel by electricity. The situation is much more complicated than that at Baltimore, where only four locomotives are used, because the train service is not only very much greater, but the terminal facilities and switching yards at each end are extremely limited. Experience has shown that electric traction is entirely adequate to meet the traffic conditions of the tunnel, and also for the suburban traffic which extends out in several directions to a distance of some 50 miles. The only serious engineering problem is the arrangement of the working conductors in the tunnel and on the suburban sections. For elevated and underground work the third-rail system in its simplest form has proved entirely adequate, but for surface roads it has not proved to be entirely economical and trustworthy. Several roads of moderate length have been operated with some considerable measure of success, but full data as regards leakage, interruptions of service, etc., are not available, and there are no signs that the number of such roads will rapidly increase, nor has any one yet installed a third-rail system in a complicated switching yard. The writer believes that the protected third rail is entirely unsuited to such a location. He thinks that with a reasonable amount of engineering skill a third-rail system can be made safe and secure, though he is by no means convinced that it is the best way out of the difficulty. The experience with sectionalized third-rail systems has not been reassuring, and they will be accepted by engineers only after a long and patient demonstration of their success.—*St. R'y Jour.*, Aug. 3, and Inter. Ed., Aug.

REFERENCES.

Multiple Unit System.—Kubierschky.—A well illustrated description of the system of the Union Elec. Co., of Berlin, of controlling the motors of all motor cars which form a train, from one point. This method is in principle similar to the well-known Sprague method of control, and differs from it only in details.—*Elek. Zeit.*, July 11.

Three-Phase Traction in Italy.—BIGNAMI.—An illustrated article on the Lecco-Colico-Chiavenna line where the "Ganz system" is to be used, as noticed repeatedly in the Digest.—*Elec. Rev.*, Aug. 10.

Energy Consumption of Electric Railways.—SIEBER.—A communication referring to the recent article of Volkers. While he agrees in general with Volkers, he makes some critical remarks on several special points.—*Elek. Zeit.*, July 4.

Calculation of the Current Distribution of Electric Railways.—PFORR.—A communication in which he replies to the criticism of Brandt and corrects an error in a diagram of his own article.—*Elek. Zeit.*, July 11.

How to Make Non-Paying Roads Pay.—COOPER.—A continuation of his serial in which he discusses this question in relation to the standardizing of apparatus.—*St. R'y Jour.*, Aug. 3, and Int. Ed., Aug.

INSTALLATIONS. SYSTEMS AND APPLIANCES.

110 *versus* 220-*Volt Installations.*—MUELLER.—A communication in which the writer, the chief engineer of Schuckert & Co., discusses the question of why engineers build plants with 220 volts at the consumers' terminals? The only point in their favor is that less copper in the line is required so that the total plant is 10 to 20 per cent cheaper than a 110-volt plant. On the other hand, there are many disadvantages of the 220-volt pressure, especially where the current is used mainly for incandescent lighting. A comparison of 110 and 220-volt incandescent lamps shows that the latter consume in the average ½ watt more per candle and have a shorter life besides. Moreover, the smallest 220-volt lamp is a 16-cp lamp. For arc lighting in general 110 volts are better, as many consumers burn only two or three arc lamps, while to use up 220 volts four or five arc lamps are required. Although the 110-volt pressure is not at all dangerous, this cannot be said, under any circumstances, of 220 volts. Some accessories in the wiring are therefore more expensive for the latter pressure. Only in plants where many motors and comparatively few lamps are in use is the higher voltage of 220 volts preferable. He says that in many cases where the installation had been made at 220 volts, great hopes were entertained that in a short time 220-volt lamps would be just as good as 110-volt lamps. He thinks that this will never be the case, as the thicker carbon filament of the 110-volt lamps will always be stronger and therefore stand a higher temperature and give a better efficiency. Any improvements would affect the 110-volt lamp just as much as the 220-volt lamp. "The Nernst lamp is still an unhatched egg in practice, and should not play any part in cautious deliberations." He concludes that 220-volt installations have become a fashion (in Germany).—*Elek. Zeit.*, July 18.

REFERENCE.

Protection Devices Against High Voltages.—BENISCHKE.—An illustrated paper, read before the Elec. Soc., of Berlin; also an account of the discussion which followed. He describes a lightning arrester with a special magnetic device for making the interruption of the arc extremely rapid; also a protective device protecting against high voltages due to resonance phenomena.—*Elek. Zeit.*, July 11.

WIRES, WIRING AND CONDUITS.

REFERENCE.

India Rubber.—A long and quite detailed article on the preparation and treatment of india rubber.—*Archiv. f. Post. u. Teleg.*; abstracted at some length in *Elek. Zeit.*, July 4.

ELECTRO-PHYSICS AND MAGNETISM.

Electric Suction.—LEMSTROEM.—The blackening of a field of buckwheat blossoms by a thunderstorm is said to be a well-known but hitherto unexplained phenomenon. The researches of the present author on the transportation of water in capillary tubes under the influence of an electric current passing through the surrounding air, shed a new light upon it. He mounted a capillary tube in a beaker full of water which was connected to earth. At a few centimeters above the capillary tube he fixed the pointed negative pole of an influence machine whose positive pole was put to earth. When the machine was worked water was sucked up along the walls of the tube and formed drops near the top. The formation of drops was observed even when the distance between the pole and the level of the water was 75 cm. The suction of water continued at even greater distances. The amount of water sucked up is proportional to the current intensity, and that, again, is inversely proportional to the square of the distance between the point and the meniscus. The amount is also, for about the first three minutes, proportional to the duration of the current. Salt soltuions act like water when dilute, but the amount sucked up is smaller. The connection with plant life is obvious, since all the vegetable humors rise through capillary tubes.—*Ann. der Phys.*, No. 8; abstracted in Lond. *Elec.*, Aug. 2.

Electro-Capillary Phenomena.—PALMAER.—An account of an extended series of experiments made to examine the rival theories of Warburg and Nernst. His main results are as follows. In contradiction to the views put forth by Helmholtz, the electro-capillary observations made up to the present time do not lead to the conclusion that the time necessary for charging is of any influence. Warburg's explanation of the "drop electrode" leads to impossibly high concentrations of the mercury salt in the condensed layer. It is not possible by means of Warburg's theory to explain the descending branch of the capillary electrometer curve. By means of Nernst's theory many of the most important electro-capillary phenomena are satisfactorily explained by the application of the general theory of electrolytic solution pressure, without the use of new hypotheses. But this theory cannot yet explain all phenomena in the region of electro-capillarity. Some unexplained questions are, for example, the unsymmetrical shape of the capillary electrometer curve, different values of the maximum surface tension, the potential difference between mercury and solution at the point of maximum surface tension, etc.—*Ofvers. Afkgl. Vetensk. Acc. Forhandl.*, 1901, 2, p. 139; abstracted in *The Elec. Chem. and Met.*, July.

Theory of Ions in the Conduction of Electricity Through Metals.—RIECKE.—A brief account of an experiment which he made in order to investigate whether positive metallic ions play a part in the conduction of electricity through metals. The apparatus which he used consisted of three equal cylinders, two of copper, the third of aluminum, the latter being placed between the two copper cylinders and the whole system being inserted in the charging circuit of a storage battery for a year. During this time 958 ampere-hours had gone through the cylinders. In an electrolytic cell they would have caused the deposition of 1.14 kg. of copper. Careful determinations of the weights of the single parts at the beginning and at the end of the year showed no variation of the weights. "The supposition, that in the conduction of electricity through metals movable positive metallic ions play a part, is therefore not correct."—*Phys. Zeit.*, Aug. 3.

Analogy Between the Nernst Incandescent Filaments and Gases.—KAUFMANN.—He has shown that the electrodynamic behavior of conducting gases may be deduced from an empirical curve, the so-called "characteristic," which gives a relation between the e. m. f. at the ends of the gaseous interval and the intensity of current. For stability of equilibrium the condition must be fulfilled that the resistance of the remainder of the circuit is greater than the negative differential quotient of this e. m. f. to the current. Since these results are obtained independently of the unknown mechanism of discharge, it follows that they must be applicable to any conductor whatever. Thus a solid body possessing a "characteristic" similar to that of a gas, must show the same peculiarities, such as discharge potentials, minimum currents and intermittent discharges. The existence of these peculiarities in a Nernst lamp filament is proven, and the numerical data of the "characteristics" of this filament are given.—*Am. der Physik*, No. 8; abstracted in Lond. *Elec.*, Aug. 2.

Top Factor.—LA COUR.—A brief critical remark on Benischke's suggestion to introduce the term "top factor" for the ratio of the maximum value and the effective value of an alternating wave for the characterization of the wave form (Digest, Sept. 8, 1900). He is not in favor of this suggestion, and tries to prove that the use of the form factor for the calculation of the maximum induction in some cases leads to wrong results. He also criticizes a special point in Benischke's calculations.—*Elek. Zeit.*, July 4.

BENISCHKE.—A reply to La Cour's criticism, which he endeavors to refute.—*Elek. Zeit.*, July 18.

Magnetic Action of Cathode Rays.—VON GEITLER.—While a magnet deflects a beam of cathode rays, the latter does not exert any corresponding action upon a magnet. There is an action, in fact, without a reaction. It has been explained by supposing that the return stream of cathode particles exactly neutralizes the action exerted by the cathode beam. Even if the cathode beam filled practically the whole of the tube, the return stream might pass along the wall and constitute an "inductionless winding." If, in such a case, a small magnet could be suspended in the cathode stream itself, it would prob-

ably show some deflection. That this is actually the case, has been proven by the present author who suspended a small magnet in a long and wide tube, in the center of the stream, and found a deflection such as would have been produced by the current passing if an ordinary conductor had been substituted for the tube. On bringing the magnet near the wall of the tube, a contrary deflection was observed.—*Ann. der Physik*, No. 8; abstracted in Lond. *Elec.*, Aug. 2.

Influence of the Form of the Pole-Pieces of Magnets Upon the Tractive Force.—BENEKE.—A discussion of the question for which form of the pole pieces of a magnet the tractive force is a maximum. He assumes magnet poles with conical surfaces, the cross-section being shown in the adjoining figure. The question which he discusses

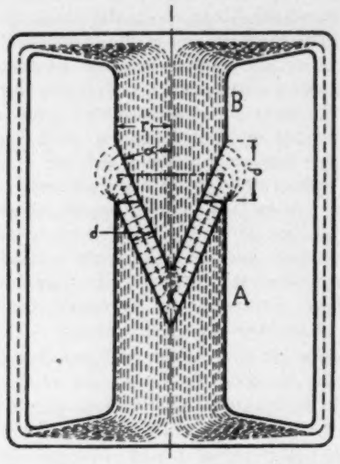


FIG. 1.—POLES WITH CONICAL SURFACES.

is: In what way does the tractive force depend upon the angle α shown in the figure? For which angle α is the tractive force a maximum? The case that the surfaces of the poles are plane and parallel is evidently a special case of this general case, namely, when the angle α is equal to 90 degs. He gives the analytical solution of the problem and applies it to a numerical example, the total ampere turns being assumed to be 7000. The results are given for cast steel and cast iron in the curves in the adjoining diagram. It will be seen that for plane parallel pole surfaces the nature of the material is of no influence ($\alpha = 90$ degs.), but for angles up to about 40 degs. cast steel gives a considerably higher tractive force than cast iron. The maximum of the tractive force is obtained for $\alpha = 20$ degs. with cast steel and for $\alpha = 28$ degs. with cast iron. The two curves represented by lines drawn out are calculated theoretically, the dotted line has been

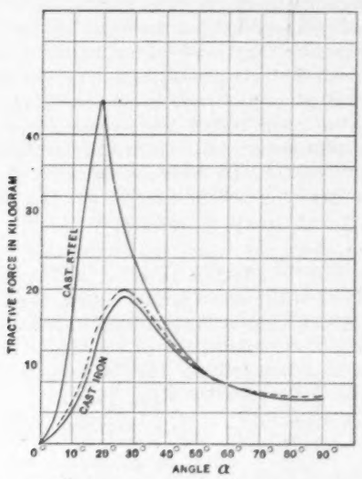


FIG. 2.—TRACTIVE MAGNET CURVES.

determined by experiment, and is in good agreement with the theoretical curve. Magnets based upon this principle are built by the Gen. Elec. Co., of Berlin, for many purposes, and have the advantages of smallness and great power. The ampere turns and the consumption of watts for a given tractive force are very small. Cast steel is used as the material.—*Elek. Zeit.*, July 4.

REFERENCE.

Terrestrial Magnetism.—The July number contains the programme of the international co-operation in researches on terrestrial magnetism in 1902 and 1903. A paper by Eschenhagen on a new form of the Lloyd scale. A paper by Neumayer on the mean secular change of magnetic declination for epoch 1890 to 1900. A brief paper by Cady on Wild's new metheod for determining the variation of magnetic inclination. A paper by Fraser on the unifilar magnetometer of the magnetic survey of India. A note by Watson on a graphical method for determining the *P* correction in the deflection experiment. A note by Bauer on the secular motion of the earth's mean magnetic axis, and a biographical sketch with portrait of Professor E. Mascart.—*Terr. Magn.*, July.

ELECTRO-CHEMISTRY AND BATTERIES.

The Best Structure of Carbon Electrodes.—HAERDEN.—An article with illustrations showing microscopical photographs of the structure of carbon electrodes. The first picture shows a carbon, obtained from an American firm, which "is about the best that can be had in this line." Specific gravity 1.92, specific resistance 12 (referring to 1 square millimeter, 1 meter length, internat. ohm), conductivity 0.083; the loss in a 2 per cent sodium chloride solution 0.01 gram per square centimeter and per hour at 0.1 ampere. He further experimented with an electrode which had been made from a coarse anthracite mass with an addition of 30 per cent of tar, compressed under 250 atmospheres and baked. Later it was carefully graphitized in the absence of air. Specific gravity 1.44, specific resistance 27.75, conductivity 0.036, loss per square centimeter and hour at 0.1 ampere, 0.032 gram. He then experimented with an electrode which had been made in the same way as the one just described, but which had not been graphitized. Specific gravity 1.4325, specific resistance 69.91, conductivity 0.014, loss 0.0675 gram; this shows that by graphitizing the resistance is reduced to one-third its former value and the loss of to one-half. The figures show that the best structure, that of the American carbon, is one in which the single grains are well embedded in the intermedium. The main material and the intermedium are attacked equally and very little. This is not the case in the other carbons which show large pores, especially the graphitized carbon. He concludes that ordinary tar alone is not a suitable intermedium. He is experimenting to find out what material must be added to the tar. Experiments in which he tried to use molasses obtained from sugar plants as intermedium were not successful. Experiments in which he reduced the amount of intermedium by the application of high pressures gave better results. At a pressure of 350 atmospheres the amount of intermedium could be reduced by 40 per cent; but it was found that the following mechanical treatment became much more difficult. "The American carbon has been prepared without doubt under a very high pressure, and with a small amount of ordinary intermedium. This explains the uniform and small loss." Graphitizing alone, even when done very completely, is not sufficient.—*Elek. Zeit.*, July 18.

Effect of Gravity and Pressure on Electrolytic Action.—RAMSEY.—He refers to the effect of gravity upon a cell, made in the form of a tube with the electrodes in the ends, the anode being dissolved and the cathode plated by the current. When the tube is vertical, the energy required for the transportation of metal from the anode to the cathode is greater than when the tube is horizontal. This effect must be visible in the counter e. m. f. He gives a review of the experimental work done in this direction, and also of the experimental work on the effect of pressure upon the e. m. f. The looked-for effect in the case of gravity has been obtained with a considerable degree of accuracy by using the chlorides of the metallic earths and with a much less degree of accuracy by using cadmium iodide. The effect of pressure on the more common forms of commercial cells gives results which accord with theory in a very remarkable manner. He then describes experiments of his own. He has investigated the effect of gravity in zinc and cadmium sulphates, and the effect of pressure upon cadmium cells and Clark cells.—*Phys. Rev.*, July.

Law of Mass Action for Strong Electrolytes.—STEINWEHR.—A German Electrochem. Soc'y paper. It is well known that Ostwald's formula for the relation between conductivity and concentration (which is a direct consequence of the law of mass action) has been found to be in disagreement with the measurements in the case of strong electrolytes (KCl, NaCl, etc.). This has been considered as one of the weakest points of the dissociation theory. The present author starts from thermodynamical considerations and applies experimental results, obtained by Fanjung on electro-striction (i. e.,

the contraction of the solvent, due to the dissolution of an electrolyte), and those obtained by Arrhenius on the effect of the presence of neutral salts in the inversion of cane sugar. His purpose is to correct the values of the equilibrium constant for KCl and NaCl, determined by measuring the conductivity. While these values should be constant, they are found quite different. After he has applied his correction, however, the agreement is much better.—*Zeit. f. Elektrochemie*, June 6.

REFERENCE.

Electrolytic Reduction of Organic Compounds.—HEWITT.—A continuation of his serial on "Applications of electrolysis to organic compounds." In this part he deals with the large amount of work which has been done in the direction of electrolytic reduction of organic compounds. It has been carried out both in acid and alkaline solution, the results corresponding with those obtained by chemical means, but in some cases, for instance, the conversion of nitrobenize into paraminophenol, the electrolytic method is far preferable to the direct chemical method.—*The Elec. Chem. and Met.*, July.

UNITS, MEASUREMENTS AND INSTRUMENTS.

Measuring the Energy of Three-Phase Motors.—STERN.—Measurements of the energy of three-phase motors are often based upon the assumption that in general the three phases of a motor have equal current and phase difference. The construction of meters more especially becomes simpler under this assumption than that of meters in which the energy of an unbalanced three-phase system is measured. He discusses two approximate methods: The "zero point method" and the "three-wire method." He shows that the error of a measurement with the three-wire method, with the use of two-line currents, is equal, but of opposite sign, to the error of a measurement with the zero point method, when the third-line current is used. He gives long calculations and an account of a series of measurements which he has made. He finds that both methods are very inexact, and the construction of meters or wattmeters should not be based upon them.—*Elek. Zeit.*, July 4.

Standard Cells.—RUPP.—A long account, with many tables, of an experimental investigation of the Clark cell and the Weston cell. He investigated the e. m. f. and internal resistance on open circuit, and the effects of small currents being taken out for a short time. He finds that, on the whole, the Weston cell is a more reliable standard cell than the Clark cell. A Weston cell is not injured when a current of 0.0001 ampere is taken out of it for several minutes; but this must not be done repeatedly, as otherwise the e. m. f. and still more, the internal resistance is changed.—*Elek. Zeit.*, July 4, 11, 18.

Electrical Black Body.—LUMMER and KURLBAUM.—A description of their electrically heated "ideal black body," with which they proved that the total radiation of such a body is proportional to the fourth power of the absolute temperature. It consists of a double cylinder, the outer one being of platinum, which is electrically heated, while the inner one is of porcelain lined with a mixture of chromium, nickel and cobalt oxides, which resist temperatures of over 1500 degs. A thermocouple is introduced into the center of the inner tube to determine its temperature. A series of diaphragms, getting narrower towards the end, "lines the same tube." Thus the essential condition is fulfilled of having a hollow body with walls at a uniform temperature. If necessary, the inner tube is surrounded by two successive air chambers, the last being contained in an asbestos tube. Then a temperature of 1560 degs. may be obtained with a current of less than 100 amperes. At that point the porcelain used by the royal. Prussian porcelain factory begins to soften and acquire a conductivity which interferes with the readings of the thermocouple.—*Ann. der Physik*, No. 8; abstracted in Lond. *Elec.*, Aug. 2.

Prize Offered for a Speed Indicator.—The Grosse Berliner Strassenbahn has offered two prizes of $750 and $375 each for the first and second best speed indicator for electric cars. The conditions which have to be fulfilled include the indication of two or three maximum speeds by a visible or audible sign, simplicity of transmission motion from the axle of the car, low maintenance and easy adjustment. The device is to remain the property of the inventor, but the railway company is to have the right to have any number of them built for use on its cars, and of those of the companies controlled by it in Berlin, by paying a royalty of 10 marks each.—*St. R'y Jour.*, Int. Ed., Aug.

TELEGRAPHY, TELEPHONY AND SIGNALS.

REFERENCE.

Multiplier.—SEIBT.—An article on "The theory of the multiplier for quick electric oscillations." The multiplier is a coil used by Slaby in his wireless telegraphy experiments for increasing the effect of the electric waves. The present author investigates its action mathematically.—*Elek. Zeit.*, July 18.

MISCELLANEOUS.

REFERENCES.

British Electricians in Germany.—Continuations of the serials on the recent visit of the Brit. Inst. of Elec., Eng. to Germany. A well illustrated description of Siemens & Halske's cable works near Berlin, in Lond. *Elec.*, Aug. 2. Descriptions of the Nuremberg municipal electric station, the plant of Lahmeyer & Co. in Frankfort, the municipal stations of Frankfort, Bockenheim and Weisbaden in Lond. *Eng'ing*, Aug. 2.

Paris Exposition.—REYVAL.—An illustrated description of a 600-kw, three-phase alternator of the inductor type, exhibited by Shutter & Harle. The e. m. f. at the terminals is 5200 volts.—*L'Eclairage Elec.*, June 22.

REYVAL.—An illustrated description of machines exhibited by Smit & Co., of Slikkerveer. Direct-current dynamos of 65 kilowatts and of 28 kilowatts, direct-current motors of 4 horse-power and 13 horse-power, a 40-kilovolt ampere, three-phase transformer, and a 10-hp three-phase induction motor.—*L'Eclairage Elec.*, June 29.

REYVAL.—Illustrated descriptions of a 1000-kw, 550-volt direct-current dynamo of Siemens & Halske, of Vienna; also of machines exhibited by Rieter & Co., of Winterthur; a 45.5-kw direct-current dynamo, a 25-hp railway motor, a 30-kw three-phase transformer, and two three-phase induction motors, the one of the "variable resistance in armature" type with brushes, the other of the short-circuited armature type.—*L'Eclairage Elec.*, July 6.

New Books.

NATURE'S MIRACLES. Familiar Talks on Science. By Elisha Gray, Ph.D., LL.D. Vol. III. Electricity and Magnetism. New York: Fords, Howard & Hurlburt. 248 pages, illustrated. Price, 60 cents.

This is a very readable little volume that requires no trained technical mind for its enjoyment. It is a sort of historical sketch of different electromagnetic industries made with considerable accuracy, some autobiography and a plentiful suspicion of humor. The author was the inventor of the harmonic multiplex telegraph, and a distinguished worker in the early development of the telephone. It was the author, in fact, who contested with Bell the first development of the telephone in the United States. This and a number of interesting stories elucidate and render agreeable the description of electrical apparatus and its modes of operation. It is pleasing to see how much amusement and vivacity may be scattered through the text of a really instructive volume without marring its style or palling upon the reader.

The authorship of the following is not stated, perhaps from modesty:

"Time was when one must hold his ear
Close to a whispering voice to hear,
Like deaf men nigh and nigher;
But now from town to town he talks,
And puts his nose into a box,
And whispers through a wire."

It is impossible to take the book up without being interested, and it is impossible to take an interest in the book without being instructed.

PRACTICAL ELECTRICAL TESTING. By G. D. Aspinall Parr, Asso. M. I. E. E. London and New York: Longmans, Green & Co. 392 pages, 231 illustrations. Price, $2.50.

This work is intended to be used in connection with a systematic course in that part of electrical laboratory work which, in this country, is generally carried on in the physical laboratories. The testing of dynamos, motors, transformers and other engineering apparatus is not dealt with. The book is about equally divided into two parts —the second part being termed an appendix.

The first part gives directions for performing 120 experiments. The experiments consist in absolute measurements, or comparative determinations of resistance, of e. m. f., of current, of quantity, of

capacity, of specific inductive capacity, of permeability, of hysteretic loss, and of self and mutual inductance. To this list should be added the determination of those terrestrial magnetic elements whose uncertainty of magnitude and direction is, to a large extent, responsible for the ever increasing adoption of the D'Arsonval galvanometer.

The directions for performing the experiments are in each case given under the following four heads: Introduction, Apparatus, Observations and Inferences. Under "Introduction" is given a discussion of the theoretical considerations which pertain to the test. Under "Apparatus" is given a description of the apparatus to be employed in the test. Its proper magnitude or sensitiveness is often mentioned. Under "Observations" is given a diagram of the connections, specific directions as to the routine of performing the test, and a tabular blank to be copied and filled in as the test progresses. Under "Inferences" are given a few suggestions as to where a student should direct his thoughts.

The appendix is divided into three parts. The first gives the mathematical deduction of all those formulas which have been previously employed and were at all obscure. The second part describes the apparatus which is used in performing the tests. These descriptions are illustrated by means of half-tones or wood cuts. Some of the apparatus is that constructed in or for the author's laboratory. Some also is well known through the catalogues of instrument dealers. The third part consists of a few tables of physical constants. The subjects of these are resistivities, specific heats, electro-chemical equivalents, e. m. f.'s of Clark cell, e. m. f. and internal resistance of cells, relation between practical and absolute units, molecular conductivity of solutions and useful data. There is also appended a table of logarithms, natural tangents, squares of numbers, reciprocals of numbers, and double square roots.

The methods described in this book are in nowise original. The book as a whole, because of its arrangement is admirably adapted to its use as a laboratory handbook. The use of blank forms, to be filled in by the student, seems to be the only practical method where large classes abound. It would be better if the student could be made to do his own tabulating. It is questionable, however, if he does not learn more from filling in the blanks of a well designed table than from poorly designing his own table.

BOOKS RECEIVED.

Transactions of the American Institute of Electrical Engineers. Vol. XVII. New York: American Institute of Electrical Engineers. 822 pages, illustrated.

Dental Electricity. By Levitt E. Custer. Dayton, Ohio: U. B. Publishing House. 531 pages, 208 illustrations. Price, $4.

High-Temperature Measurement. By H. Le Chatelier and O. Boudouard. Translated by George K. Burgess. New York: John Wiley & Sons. 230 pages, 52 figures. Price, $3.

How to Become a Good Mechanic. By John Phin. New York: Industrial Publication Company. 68 pages. Price, 25 cents.

A Hand-Book for Apprenticed Machinists. By Oscar J. Beale. Providence, R. I.: Browne & Sharpe Manufacturing Company. 141 pages, illustrated.

Directory of Electrical Societies, Etc.

American Street Railway Association. Next meeting, New York, Oct. 9, 10 and 11, 1901.

Association of the Edison Illuminating Companies. Next meeting, Buffalo, Sept. 10, 11 and 12, 1901.

International Association of Municipal Electricians. Next meeting, Niagara Falls, N. Y., September 2,3 and 4, 1901.

New York State Street Railway Association. Next meeting, Rochester, N. Y., September, 1901.

Ohio Electric Light Association. Next meeting, Put-in-Bay, Ohio, Aug. 20, 21 and 22.

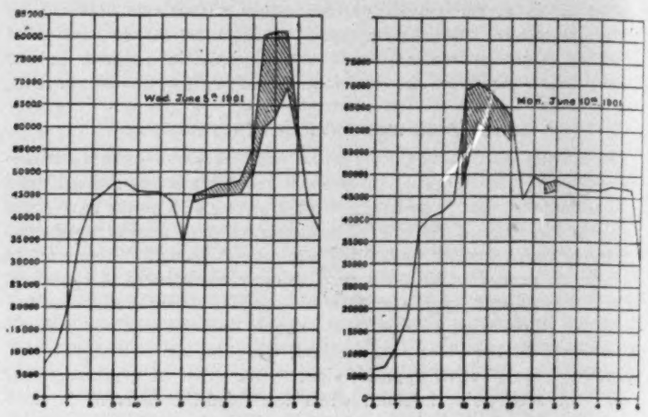
Old-Time Telegraphers' Association and United States Military Telegraph Corps. Next meeting, Montreal, Que., Sept. 11, 12 and 13, 1901.

Pennsylvania State Street Railway Association. Next meeting, York, Pa., October, 1901.

Storage Batteries in Central Stations.

Among the many problems which confront the manager of a central lighting station, one of the most troublesome, especially during the summer season, is that which is caused by the sudden load thrown on the station by a thunderstorm—the overcast sky causing thousands of lights to be turned on for a period of from half an hour to possibly several hours. This creates a peak for which no preparation has been made necessitating firing up an extra boiler and starting additional generating units—all of which takes considerable time and possibly by the time steam is generated, the storm has broken, and the necessity for extra work has passed.

In no way can the usefulness of an installation of chloride accum-



FIGS. 1 AND 2.—CURVES SHOWING OPERATION OF BATTERY.

ulators be better shown than in just such an emergency load, and the accompanying diagrams, which show their operation in the battery stations of the Chicago Edison Company on a dark day, are striking illustrations of the manner in which the battery "helped them out."

Fig. 1 is a curve showing the operation of the battery on June 5, 1901, and Fig. 2 that of June 10. Both of these curves show in the shaded portions the work done by the battery.

Another instance of the instant availability of the storage battery to tide over sudden emergencies in central stations was described and illustrated on page 254 of last week's issue. Oddly enough, the same plant was concerned in both cases. These records show the value of a storage battery plant in connection with an electric lighting system.

Eight Horse-Power Gasoline Carriage.

Mr. A. L. Riker has worked out for the Electric Vehicle Company, of New York City, a new form of gasoline automobile for touring purposes, herewith illustrated. It will maintain, if needed, a speed of 25 miles an hour on level roads, and is good for any hill on the low gear. It is freely used for runs of 100 and 150 miles.

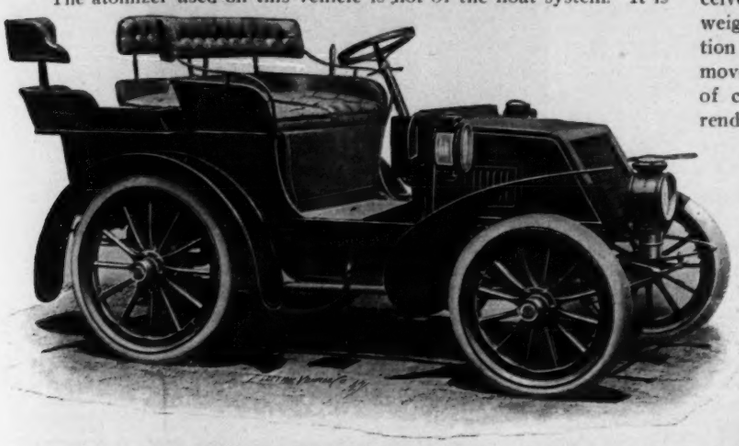
This vehicle is equipped with a Riker vertical, double-cylinder, water-cooled gasoline engine, developing 8 horse-power at 900 r. p. m. The engine consists of two 4 by 4 cylinders, attached directly to the body at its forward end, and covered by the usual form of engine bonnet. All moving parts are thoroughly protected from dust and dirt, and are easily accessible for inspection and adjustment. Enough gasoline, lubricating oil and cooling water are carried on board for a run of 150 miles under ordinary conditions. The complete weight of the vehicle with tank all full is approximately 1700 lbs. The main seat is of ample width for two occupants, and the projecting platform behind the seat is arranged to take a tonneau body, accommodating two passengers or a rumble seat for an attendant. If desired, however, this rear space can be used for carrying touring trunks. The change gear system provides for three speeds ahead and one backward. The reductions are approximately 16 to 1, 7 to 1 and 4 to 1. Any gradation of speed between zero and the maximum can be obtained by means of the clutches and the igniter and throttle levers carried on the steering wheel spindle.

The body is carried from the main running gear on two full elliptic springs in front and two half elliptic spring behind, and is of platform, angle iron construction, so made that the seats can be

stripped off without interfering with the operating levers, leaving a plain platform. The transmission gearing is contained in one housing, which is also slung from the body immediately in the rear of the engine, being coupled to the engine shaft by a flexible coupling, relieving both the engine and gear shafts of any cramping due to springing of the body. The system of gearing used on this vehicle is of the friction clutch type, and is entirely pedal-operated. There are two pedals located on the floor capable of being oscillated forward or backward by the toe or heel of the operator's foot. A forward motion on the left pedal operates the high gear and a backward motion operates the middle gear. These are the only two that have to be used on all ordinary running, as the vehicle has an engine of such power for the weight of the vehicle that it is very rarely the low gear has to be resorted to.

The system employed is of the usual type, including the pump, water tank and radiating coil. The construction of the cooling coil is so arranged that individual tubes can be readily removed and replaced in case of a leak, which is not the case with most types of cooling coil. The lubrication of the entire motor is automatically taken care of from one oil valve which feeds oil into both cylinders and crank case. No attention other than the opening of this valve to a certain fixed point and keeping the oil tank full is necessary. The gear case is oil tight, and when once supplied with oil will run for weeks without any attention. The outboard sprocket bearings are automatically ring oiled.

The atomizer used on this vehicle is not of the float system. It is



8-HP GASOLINE AUTOMOBILE.

said to be simpler, has fewer working parts, and overcomes the difficulty sometimes met with in the float type of atomizer on variable speed engines where the limits of variation of speed are very wide. The engine on this vehicle can be run from 200 to 2000 r. p. m. without any appreciable variation in the quality of the mixture obtained from the atomizer. The ignition is obtained by means of a jump-spark, and permits the advancing or retarding of the point of ignition as may be desired by the operator. Primary batteries with an improved and perfected type of induction coil are used, there being two coils, one for each cylinder.

This vehicle is equipped with two brakes; one, pedal, working on drums on each of the rear hubs, the second hand operated and working on a band around the balance gear on the counter-shaft.

The steering is accomplished by means of a wheel. The main controlling levers, aside from the two which are pedal operated for change gears consist of one for varying the time of ignition and one for operating a throttle on the engine. These two levers are located at the side of the steering post immediately below the steering wheel —the left hand one operating the igniter and the right hand one the throttle.

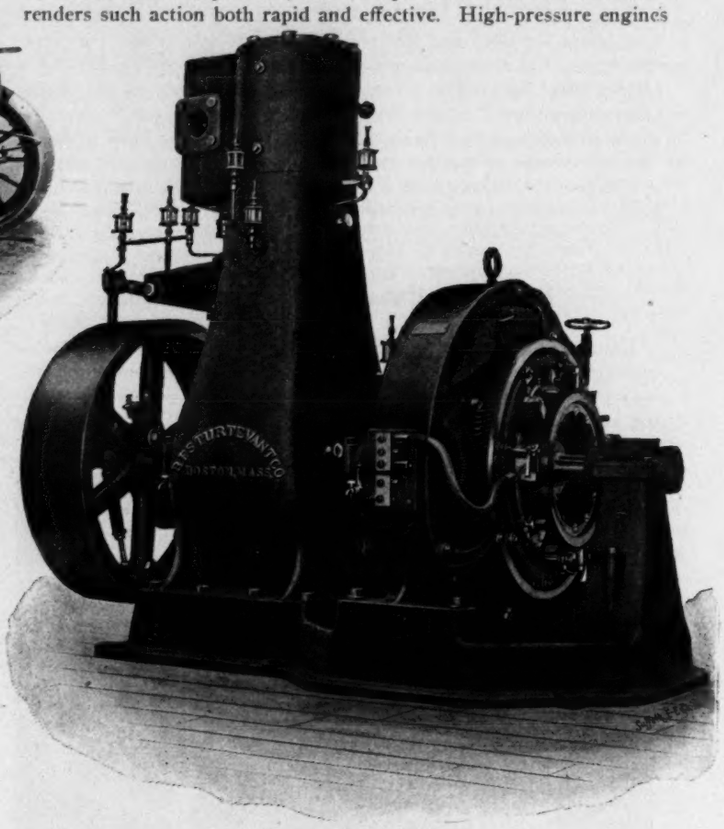
No attempt has been made on these vehicles to time the point of ignition automatically by means of a governor. For high speeds, of course, it is necessary to advance the point of ignition beyond this, so called, neutral point, and the igniter lever then gives a very easy means of obtaining any desired speed. The lubricating oil tank is located at one side of the engine, and is so arranged as to be very easily filled. The water tank stands immediately in front of the dash inside of the engine bonnet, but can be filled without removing the latter. The gasoline tank is in the body under the operator's seat. The vehicle is equipped with wooden wheels throughout with 28 by 3-inch double tube tires in front and 32 by 3-inch double tube tires in the rear.

New Railway Signal.

George W. Cohen, of Allegheny, last week gave a practical demonstration of a new electric railway signal system before a number of prominent railroad officials, which is claimed to be likely to revolutionize signaling in the future. Mr. Cohen's plan provides for a signaling apparatus operated by electricity without a continuous track circuit. He uses a metal shoe, which comes in contact with the wheels and operates the signals. When this shoe comes in contact with the wheels it also operates a telephone system, by which the train dispatcher is enabled to communicate with the conductor or any trainman on the moving train, so that the work of clearing the main line in case of a wreck or any other accident can be greatly facilitated. The demonstration took place in a large hall in Allegheny City, which Mr. Cohen had had fitted up for this occasion. Several railroad men witnessed the test.

A New Sturtevant Generating Set.

A new design of generating set built by the B. F. Sturtevant Company, of Boston, Mass., is illustrated in the accompanying cut. The engine is of the single-cylinder vertical type, and of very substantial construction. The frame and cylinder are cast and bored in one piece, the design being such as to combine the maximum of rigidity and accessibility. The valve is of the balanced-piston type, and receives its motion through a rocker, from a pin on the governor weight, which is so pivoted to the wheel that a change in the position of the weight causes the pin to swing across the shaft. This movement changes the travel of the valve and regulates the points of cut-off and compression, and the perfect balance of the valve renders such action both rapid and effective. High-pressure engines



GENERATING SET.

of this type are built in seven sizes, and designed for 90-lb. boiler pressure. A similar line of four sizes of low-pressure engines designed for 40-lbs. pressure are also built.

The generator is of the eight-pole type, primarily designed by the Sturtevant Company as a motor for direct connection to centrifugal fans. The large diameter and relatively low speed of rotation particularly fits this design for attachment to an engine of this type. The entire arrangement is rendered very compact, the length in the direction of the shaft being reduced to a minimum. With the exception of the smallest size; wrought iron field cores are used in these generators. These cores are secured to the frame by bolts and are readily detachable, thus rendering the removal of the field coils a

very simple matter. In the smallest size the field cores are cast solid to the frame and the pole shoes only are removable.

The armature is usually of the barrel wound toothed, hollow drum type, the laminations of special steel plate being mounted on a cast-iron spider, the hub of which is extended to support the commutator, thus making the armature and commutator self-contained and specially adapted for direct connection. These generators when subjected to exhaustive tests have shown that after a full-load run for a sufficient length of time to attain the maximum temperature, the latter rarely exceeds 30 degs. C. on the hottest part. The open type and ample ventilation serves to keep the temperature at a minimum.

A Record Automobile Run.

A remarkable automobile endurance run was recently made from Chicago, ending Aug. 7, in which a distance of 187½ miles was made on one battery charge, the rig weighing 1200 lbs. and the battery 600 lbs. The motor-running gear, including the ball bearings, were made by the Baker Motor Vehicle Company, of Cleveland, Ohio, the motor by the Elwell-Parker Electric Company, of the same place, and the battery by the Porter Battery Company, of Chicago.

The accompanying illustration shows the vehicle, which is an electric Stanhope. The battery is of the pasted plate type and indicated a total discharge of 396 ampere-hours for the trip. The run was begun at 5.38 a. m. of Monday, Aug. 5, and there was a stoppage of four hours for sleep and five hours for meals and to repair a punctured tire. On a previous trial in July with the same vehicle and a battery weighing 350 lbs., a run of 151 miles was made on one charge at an average speed of 10.91 miles per hour. On this run the average grade is stated to have been 3 per cent, with strong head winds at times, and some of the distance was made with a punctured tire.

The manufacturers of the Porter battery, with which this run was made, state that its weight is but 52.2 lbs. per horse-power hour, and they offer a guarantee of five years' life at $34 per year.

Exhibit of Exhaust Steam Utilization.

Managers of electric and power companies are showing much interest in the exhibit of the American District Steam Company, located in the north end of the Machinery and Transportation Building at the Pan-American Exposition, as shown in the accompanying

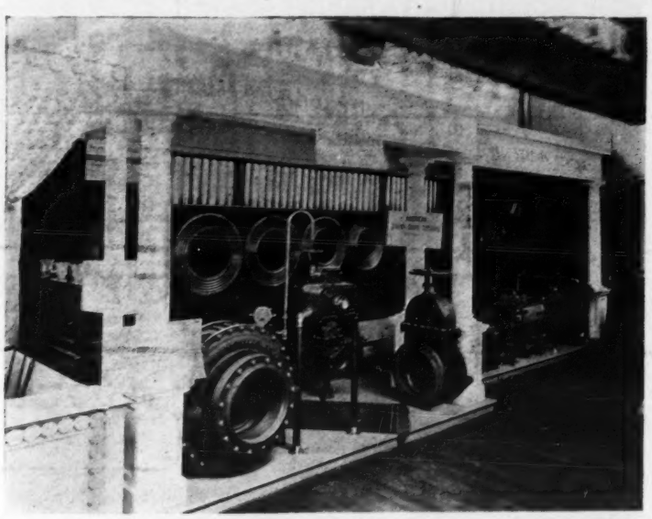


EXHIBIT OF EXHAUST STEAM APPLIANCES.

illustration. The above company is the pioneer and patentee of this system of underground steam distribution, and has had years of experience in constructing plants in different cities of this country and abroad. It has in operation over 200 of these plants, with apparatus of the nature exhibited at Buffalo.

During the past year its business has increased to such an extent that it has found it necessary to enlarge its manufacturing facilities, and has just now completed a very large factory at North Tonawanda, N. Y., within sight of the Exposition.

The company has gotten out a very good map of the Pan-American grounds, and visitors calling at its exhibit are furnished with a copy. The main office and works of this company are at Lockport, N. Y., with branch offices in Chicago and New York.

McRoy at the Pan-American.

The McRoy Clay Works, of Brazil, Ind., exhibits at the Pan-American some of its 6-ft. length conduit laid and joined to a manhole wall as in actual work. The attractiveness of the exhibit has

UNDERGROUND CONDUIT EXHIBIT.

also been greatly increased by the addition of a number of large photographs showing important work under construction in various cities with McRoy conduit duct. John T. McRoy, president of the company, has been a frequent visitor since the Exposition opened.

A Historical Exhibit of Motor Controlling Devices.

The Cutler-Hammer Manufacturing Company, from a historical standpoint, has the most interesting commercial exhibit at the Pan-American Electricity Building. Although the historical collection of rheostats and motor-controlling devices goes back only about 10 years the early types look exceedingly crude to modern eyes, nearly all being enclosed in wood boxes. From 1890 to 1893 the advance was rapid, but since that time changes have not been so pronounced.

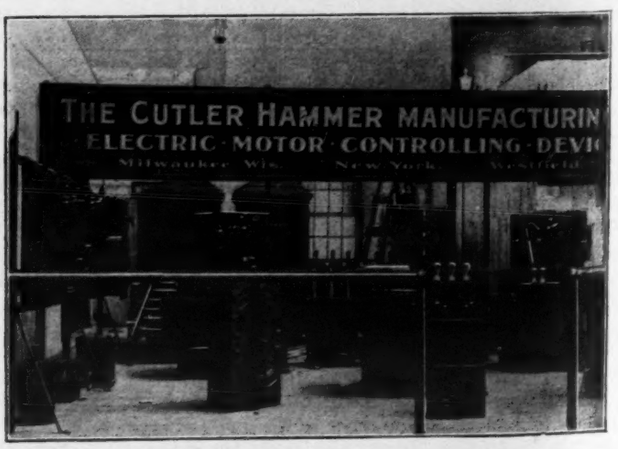


EXHIBIT OF RHEOSTATS AND CONTROLLING DEVICES.

Among the modern apparatus made by the company, motor starters with time element attachments are prominent. The exhibit, though occupying considerable space, is unobtrusive, and likely to be missed by the casual observer, though it is well worth spending some time on.

NEWS OF THE WEEK.

Financial Intelligence.

THE WEEK IN WALL STREET.—Call money closed at 2@3 per cent; time money, on mixed collateral, 4@4½ per cent, and commercial paper, which was more active, 4½@5 per cent for prime double names. In the stock market prices were not materially affected by the extension of the steel strike, the transactions being, in the main, of a professional character. United States Steel stocks were the principal features of the market. Tractions were firm, though not especially active. The sales of Brooklyn Rapid Transit for the week were 13,615 shares, the range of prices being between 73 and 75¾. Metropolitan Street Railway was quiet at figures ranging between 164 and 168¼. General Electric was rather inactive, the sales amounting to only 3600 shares, quotations ranging from 249¼ to 264, the latter being the closing figure on Friday. Interest in Western Union was maintained, quotations ranging between 91½ and 93¾. Following are the closing quotations of Aug. 19:

NEW YORK.

	Aug. 13.	Aug. 19.		Aug. 13.	Aug. 19.
American Tel. & Cable..	—	—	General Carriage.....	1	⅞
American Dist. Tel.....	—	—	Hudson River Tel.....	120	120
Brooklyn Rapid Transit..	74½	74¼	Illinois Elec. Veh. Trans.	—	—
Commercial Cable.....	—	—	Metropolitan Street Ry..	166¾	166
Electric Boat.....	17	18	N. E. Elec. Veh. Tran...	—	—
Electric Boat pfd.....	40	40	N. Y. Elec. Veh. Tran...	10	10¼
Electric Lead Reduc'n...	1½	1½	N. Y. & N. J. Tele.....	170	168
Electric Vehicle.....	5½	5½	Tel. & Tel. Co. of Am...	3	3
Electric Vehicle pfd.....	10	10	Western Union Tel.....	93	93⅛
General Electric.....	253	263			

BOSTON.

	Aug. 13.	Aug. 19.		Aug. 13.	Aug. 19.
Am. Tel. & Tel.....	160	161	Mexican Telephone.....	2	2⅛
Cumberland Telephone...	—	—	New England Telephone..	—	—
Edison Electric Light...	*255	*256	Westinghouse Elec.....	—	—
Erie Telephone.....	46	48	Westinghouse Elec. pfd..	—	—
General Electric pfd.....	—	—			

PHILADELPHIA.

	Aug. 13.	Aug. 19.		Aug. 13.	Aug. 19.
American Railways.....	40	40	Phila. Traction.....	95¾	95¾
Electric Storage Battery.	70	75	Philadelphia Electric.....	5⅛	5
Elec. Storage Batt'y pfd.	70	75	Pa. Electric Vehicle.....	¾	¾
Elec. Co. of America....	7⅛	7¼	Pa. Elec. Veh. pfd.....	¾	¾

CHICAGO.

	Aug. 13.	Aug. 19.		Aug. 13.	Aug. 19.
Central Union Telephone	—	—	National Carbon pfd.....	83	83
Chicago Edison.....	160	155	Northwest Elev. com....	47	36
Chicago City Ry.....	201	201	Union Traction.....	15⅝	15½
Chicago Telep. Co.....	*273	*273	Union Traction pfd.....	58	59
National Carbon.....	17	17			

*Asked.

WESTERN UNION RUMORS.—The *Mail and Express* says: "The reports about a possible consolidation of Western Union, Postal Telegraph and Bell Telephone interests are based on the following facts which are vouched for by a high authority: Recently persons understood to represent the American Telephone & Telegraph Company, which is the name of the general Bell Company, made an informal proposition to the Western Union Telegraph Company to merge the three great companies above referred to. The Bell people, it is said, realized that independent telephone movements were making serious inroads into their particular field and something must be done to check this rivalry. It was thought that an alliance with the telegraph companies would present such a strong front that independent telephone projects would thereafter be unable to make any progress, while the Bell Company, Western Union and Postal Telegraph companies would all benefit from the union. Mr. Gould did not think well of such an alliance with telephone interests, but it is believed that if anything is done it will be a merger of Western Union and Postal Telegraph properties. It is said he is satisfied that if it desires to, the Western Union can easily branch out into the telephone field on its own account. For some time there has been a plan on foot for the Western Union to establish a long-distance telephone service, and some of the new bonds are believed to have been issued for this purpose." The *Mail and Express* does not seem to see that such a telephone alliance scheme would do far more to fan to fever heat the "independent telephone" enthusiasm than to quell it, and would probably hurt the Western Union most seriously.

PARALLELING NEW YORK CENTRAL.—The Utica, N. Y., City Common Council, after a number of protracted discussions and several public hearings, has granted a franchise to the Cleveland, Ohio, syndicate, which recently acquired control of trolley lines in and around that place, whereby that corporation is placed in a position to offer the New York Central road serious competition. The Council granted permission to lay a double track in Bleecker Street, the main highway running eastward through the city. This means the paralleling of the New York Central tracks from Little Falls on the east to Oneida on the west, a distance of 50 miles. Four hundred men are at present engaged in extending the line westward from Utica, while 250 laborers are building a roadbed eastward from the city line. On the west the new road will pass through Oriskany, Rome, Verona and Oneida, and on the east, Frankfort, Ilion, Mohawk, Herkimer and Little Falls. Eighty pound rails are being laid and $75,000 worth of new rolling stock has already been ordered. The men who control this enterprise are in Standard Oil, and are interested in the Wabash Railroad, which now has a line east to Buffalo. Ever since the completion of the road its owners are said to have been embroiled with the Vanderbilts over the connections with New York and Boston.

BOSTON LIGHTING CONSOLIDATION.—Changes made in the board of directors at the annual meeting of the Boston Electric Light Company, held last week, practically completed the consolidation of the Boston Company with the Edison Electric Illuminating Company under the name of the latter. Instead of re-electing the old board the stockholders chose C. L. Edgar, W. C. Baylies, T. J. Coolidge, Jr., George Dexter, C. Minot Weld, Henry B. Cabot, Edward B. Maltby, Isaac T. Burr, and Edward W. Burdett. Of these the first six represent the Edison Company, the last three were president, vice-president and treasurer and counsel of the Boston Company. Mr. Burdett was elected treasurer and clerk, of the Boston Company. He will also be retained as counsel in the Edison Company. The Boston Electric Light Company presented to the stockholders a balance sheet showing assets of $5,646,377 on June 29, and liabilities of $1,396,377, in addition to $3,000,000 capital stock and mortgage bonds aggregating $1,520,000. The gross income of the old company for the year was just over $1,000,000, and the net profit $491,000.

PHILADELPHIA UNION TRACTION.—The report of the Union Traction Company for the year ended June 30 will show an increase in passengers carried of about 10,000,000, which would bring the figures up to over 302,000,000. It is probable that the actual figures will be in excess of these. For the 1899-1900 year the receipts from passengers were $12,996,291, or over .0444 per passenger. The present average receipt per passenger is about 4½ cents, and 10,000,000 additional fares should increase the gross receipts by $450,000, making the total passenger receipts around $13,500,000. Operating expenses last year were 42.28 per cent. Taking 32¼ per cent for convenience in figuring, as the operating ratio, the expenses would be $5,700,000, leaving a net of $7,800,000, compared with $7,371,393 for the preceding year. A surplus rather less than $1,000,000 will be shown. The estimated number of passengers carried last year, 302,000,000, compared with the city's population of 1,293,697, shows that every person in the city rode 233 times during the year.

WESTINGHOUSE ELECTRIC.—An official of the Westinghouse Electric Company is quoted in Boston as saying: "It is impossible to give any accurate figures at the present time, but our company during present fiscal year will make an exceptionally fine showing. Earnings during the six months were by far the largest in our history and there is every reason to believe that a new record will be established during the next half year."

ELECTRIC COMPANY OF AMERICA.—Announcement is broadly made of the purchase of the Auburn, N. Y., Electric Light Company, for which negotiations were about completed by the Electric Company of America at the time of the recent purchase of the Canton, Ohio, plant. It is stated on official authority that the information that the U. G. I. Company has liquidated its remaining interest in the E. C. A. Company is correct.

CENTRAL UNION TELEPHONE directors have decided to reduce the present issue of capital stock one-half, and increase the capital stock so reduced 100 per cent, which will bring into the treasury substantially $3,500,000 in cash. The matter will be put before the stockholders at once for the necessary action.

AMERICAN ELEVATED RAILROAD stock is being pushed on the curb in New York City. It is alleged that the company has something to do with a franchise for an electric elevated line from downtown to Harlem, along Broadway, with a single rail method of operation. Osborn Conjelton is the president of the company.

DIVIDENDS.—The Metropolitan West Side Elevated, of Chicago, has declared a dividend of 2 per cent on the preferred stock, payable Aug. 31. American Railways Company has declared a dividend of 1 per cent, payable Sept. 16, to stock of record Aug. 30.

RAILWAYS COMPANY GENERAL.—A meeting of the Railways Company General stockholders will be held Sept. 30 to vote on the proposition to reduce the capital stock from $1,500,000 to $1,200,000. The plan is to give four shares in a new $10 paid stock for 10 shares of the present $5 paid stock; or, in other words, to exchange on the basis of 80 per cent for each 100 per cent of present holdings. This means:

Reduction of capital	$300,000
Present capital	1,500,000
New valuation	$1,200,000
Old.	
Capital (par $5)	$1,500,000
Shares (par value)	300,000
New.	
Capital (par $10)	$1,200,000
Shares	120,000

The company earned a dividend last year, and if the reduction in capital plan is authorized, a dividend of 4 or 5 per cent will probably be declared on the new capital. An inventory of the company's property as of June 30 showed assets valued at $1,220,133. The proposed reduction in capital is merely for the purpose of bringing the stock liability down to this basis.

CHICAGO ELEVATED ROADS.—It is stated from Chicago that reports are in persistent circulation that the Metropolitan and South Side Elevated Railroad companies will be consolidated within a brief period in an alliance for mutual advantage and protection against the Northwestern Consolidated. The two roads are now said to have in contemplation a joint invasion of the Stock Yards district, and both companies are known to have made surveys and secured estimates of the cost of lines to that territory. The rumored scheme, while not admitted by the officials of the roads, is asserted by persons in touch with the companies to consist of a plan for an extension by the Alley Elevated from Thirty-ninth Street to the yards at Halsted Street, and by the Metropolitan from the turn of the Douglas Park Division southward, crossing the river at Ashland Avenue and connecting with the South Side at Halsted Street, where the two lines are to combine with a stem running two or three miles south into Englewood. Both the elevated railroad companies see a menace in the quiet efforts of the American Railway Company to get into the Chicago transportation business. The application for a franchise, pending in the City Council, has aroused this concern.

HUDSON VALLEY TROLLEYS.—A certificate of consolidation of the Glens Falls, Sandy Hill & Fort Edward Street Railway Company, the Warren County Railway, Stillwater & Mechanicville Street Railway Company, Greenwich & Schuylerville Electric Railway Company, Saratoga Traction Company and Saratoga Northern Railway has been filed with the New York Secretary of State. The title of the consolidated company is the Hudson Valley Railway Company, and its capital is $2,600,000. The company will control the electric railway systems from Troy to Lake George. The officers of the company are Addison B. Colvin, president; Senator George E. Green, vice-president; Thomas O'Connor, secretary, and F. B. Cowles, treasurer.

THE GENERAL ELECTRIC COMPANY has extended the period for the exchange of preferred stock for common stock up to and including Aug. 31. There is remaining outstanding but a very small amount of preferred stock, but it is considered very advisable that all owners of the preferred stock should exchange for common stock and there may be no further opportunity to do so after Aug. 31.

Commercial Intelligence.

THE WEEK IN TRADE.—Reports to the Mercantile agencies indicate a satisfactory condition of trade generally. There was an improvement in both tone and demand, and fall trade may be said to have opened actively. Reports of the crop conditions were more cheerful, and the outlook is now more satisfactory. The Steel strike caused some dulness and cancellations, but not to the extent feared earlier. The industrial situation, if not better as regards the steel strike, is certainly no worse. Railway gross earnings for the first week of August show a gain of fully 11.4 per cent over last year, which points to the increase of 13.3 per cent on roads for July being maintained in the current month. *Bradstreet's* reports the number of failures for the week at 178, against 185 the previous week and 168 the corresponding week last year. *Dun's Review* computes the liabilities of the concerns failing for the two weeks of August at $1,785,466, against $1,510,177 the corresponding week last year. In the metal market copper was very quiet. Consumers, generally, are holding off with purchases in the hope that later on they will be able to secure supplies at lower figures. Consumption in this country is very heavy, and it is likely that manufacturers have nearly worked up their stock. Lake is quoted at 16½ cents; electrolytic, in cakes, bars or ingots, 16¼ cents; cathodes, 16 cents; casting stock, 15⅞ cents.

EXPORTS OF ELECTRICAL MATERIAL.—The following are the exports of electrical material from the port of New York for the week ended Aug. 15: Antwerp—32 packages electrical material, $635; 33 packages electrical material, $4,121. Berlin—2 packages electrical machinery, $28. British Africa—1 package electrical material, $13. Brussels—1 package electrical material, $25. Bilboa—2 cases electrical material, $215. British East Indies—8 packages electrical material, $183. Bolton—1 case electrical material, $16. Barcelona—70 packages electrical material, $2,145; 1 case electrical machinery, $27. British West Indies—50 packages electrical material, $677; 2 packages electrical machinery, $39. Central America—19 packages electrical material, $69. Cuba—1 case electrical machinery, $60; 36 cases electrical material, $1,402. Chili—42 packages electrical material, $1,120; 8 packages electrical machinery, $450. Ecuador—1 case electrical material, $75. Glasgow—1 case electrical material, $50. Hamburg—55 packages electrical material, $2,024. Hayti—3 packages electrical material, $31. Havre—42 cases electrical material, $1,084; 2 cases electrical machinery, $50. London—80 packages electrical machinery, $3,070; 44 cases electrical material, $742. Leicester—2 cases electrical machinery, $75. Lisbon—2 cases electrical material, $188. Liverpool—82 packages electrical machinery, $7,980; 50 packages electrical material, $3,524; 1 package auto parts, $150. Mexico—4 packages electrical machinery, $325; 26 packages electrical material, $1,174. Manchester—6 packages electrical machinery, $410. Milan—17 packages electrical material, $350. New Castle—11 cases electrical machinery, $1,500. Nova Scotia—9 packages electrical material, $31. Peru—31 packages electrical material, $684. Santo Domingo—11 packages electrical material, $122. U. S. Colombia—16 packages electrical material, $282.

SPRAGUE APPARATUS ABROAD.—The Sprague Electric Company is receiving many orders for its apparatus from all parts of the country and abroad. Among a few recent orders are the following: Ninety-kw split-pole generator, shipped to Bailey, Walker & Co., Buenos Aires, S. A.; 125-kw split-pole generator, Steelton Light, Heat & Power Company, Steelton, Pa.; 37½-kw split-pole generator, Ft. Wadsworth, Staten Island; 37½-kw engine type generator, Ft. Hancock, N. J.; 80-hp motor, American Linseed Company, Staten Island; 100-kw engine type split-pole generator, Geuder & Paeschke Manufacturing Company, Milwaukee; 50-kw generator and 15-hp motor, Roe & Conover, Newark, N. J.; 85-hp motor, John Stephenson Company, Elizabeth, N. J.; 75-kw split-pole generator, Chase Rolling Mill Company, Waterbury, Conn.; 75-kw split-pole generator, Fred Miller Brewing Company, Milwaukee; 100-kw, 550-volt split-pole belted type generator, Plymouth Mills, Plymouth, Mass.; 100-kw belted type split-pole generator, C. S. Ashley, Toledo, Ohio; 100-kw, 550-volt, belted type split-pole generator, and various motors up to 50 horse-power, T. C. Keller, Chicago; a quantity of motors for the mines and refining plant of the Arlington Copper Company, Arlington, N. J.; 100-hp motor, American Locomotive Company, Cooke Works, Paterson, N. J.; 60-kw split-pole generator, Fahys Watch Case Company, Sag Harbor, L. I.; two 25-kw engine type split-pole generators for Madison Square Garden, New York, and 100-kw split-pole engine type generator, Leland Hotel, Chicago.

THE NATIONAL ELECTRIC LAMP COMPANY, manufacturer of incandescent lamps, has opened a fine suite of offices in the Electric Building, Cleveland. J. B. Crouse is president of the company, and he is also president of the Crouse-Tremaine Carbon Company and the Fostoria Incandescent Lamp Company, of Fostoria, Ohio. H. A. Tremaine is vice-president, F. S. Terry secretary and B. G. Tremaine treasurer. There is naturally a good deal of interest in this concern, to which we have already alluded more than once; but one of the officers says: "The National Company is not yet ready to announce its plans and purposes."

TELEPHONE CONTRACT.—Mr. S. C. Platt, representing the Kellogg Switchboard & Supply Company, of Chicago, has closed a contract with the Richmond Telephone Company, Richmond, Va., for a new switchboard of 5600 subscribers' capacity, and for new telephones. The amount involved is said to be $50,000. The switchboard will be operated on the common battery system, and will be a fine example of the company's well-known system, now operating in several of the largest independent telephone exchanges in the country.

DEVELOPMENT IN IDAHO.—Mr. Walter Hovey Hill, member of American Society of Civil Engineers, of Grangeville, Idaho, is preparing plans and estimates for an electric railroad from Lewiston, Idaho, to Grangeville, Idaho, 80 miles. Water power is available at reasonable cost of development. Mr. Hill would like to hear from capitalists interested in such a road. The Grangeville Board of Trade and Lewiston Commercial Club are taking the matter up, and the project is meeting with hearty approval along the entire road.

THE SNOQUALMIE FALLS POWER COMPANY, of Seattle and Tacoma, has placed an order with the Pittsburg Reduction Company for 250,000 lbs. of aluminum wire cable, which will more than double the capacity of their transmission system. Co-incident with this the enlargement of the generating station at the head works is under way, and an additional pen stock will be installed, having 50 per cent more capacity than the first one. This pen-stock will feed three waterwheel sets, each one of which will drive a direct connected Westinghouse 5000-hp generator. The underground cavity will be extended eastward about 150 ft. to accommodate the increase. Contracts have been let also for terminal sub-station structures in Tacoma and Seattle, which will be occupied and in use about Jan. 1. The present quarters for distribution purposes are rented premises. Mr. Charles H. Baker, president of the company, in whose charge the engineering and construction work is, estimates that this increase of capacity will be available in about 10 months. The Snoqualmie plant when this increase is made will have a capacity of 25,000 horsepower, and will therefore, it would seem, be the largest water-power plant in the United States outside of Niagara. All the electric street cars, all the municipal and domestic lighting, flour mills, machine shops and industries where electric motors are employed in Seattle and Tacoma, are run by the Snoqualmie plant, and effort is now being made to induce the company to extend its lines to Everett, Wash., to handle the paper mill and smelter there and to improve the local lighting service.

JAPANESE ELECTRICAL TRADE.—United States Minister Buck has sent from Tokio a copy of a report on trade in Japan prepared by the British Legation. One part of it says: The United States continues to encroach on spheres of trade which were formerly considered under the exclusive control of the United Kingdom or other nations. American competition is now a permanent feature of the import trade of Japan, and is worthy of the carecul attention of British manufacturers. The geographical situation of the United States with regard to Japan and the eagerness with which American manufacturers are seeking a market in this country will make her a competitor more and more formidable as time goes on. In 1900, Americans again secured a number of valuable contracts for the delivery of goods in 1901, including one for rails, which was estimated at £72,000. Among the reasons for the very large figures to which the import trade from the United States into Japan rose in 1900 was the fact that the extensive orders, the execution of which was undertaken there in the preceding year, included 20,000 tons of rails, which at the high price then prevailing would account for, say, £160,000. A large quantity of electrical machinery for tram lines and electric lighting and bridge work and wire, as well as flour, are also included in the returns. Telephone cable was at one time a United States monopoly, but now German makers are fulfilling large orders for it. British manufacturers, owing to the high prices asked for, have so far been unsuccessful in obtaining any contracts for this material.

LONDON UNDERGROUND ROADS.—A special dispatch from London of Aug. 17 says: While Charles T. Yerkes has gone to Budapest to investigate the Ganz electrical system on behalf of the District Railroad, George Westinghouse, who sails for New York to-day on board the American line steamer "St. Paul," has gone home partly in the interest of the American capital of the Metropolitan Underground Railroad. The deadlock between these companies appears not to have been due to differences between Mr. Yerkes and the English owners of the Metropolitan Railroad, but the contest is between the two Americans for the control of either or both of the roads. Mr. Westinghouse, though not known here as a large stockholder of the Metropolitan Railroad, has the confidence of the managers, and suggested schemes for the electrification and enlargement of the road, that took hold of their imagination, as far more splendid than those of Mr. Yerkes. The shrinkage in British railroad dividends, consequent upon the steady and uncheckable depreciation of shares, is discussed by Robert P. Porter, in a letter to the *Times*, from the standpoint of electrical railroads, which already cause reduced profits. Mr. Porter finds that the only salvation is in electricity. He says: "For the purposes of concentrating the population in the morning and distributing it at night, the steam locomotive must give way to the electric. It is like putting a steam hamher in motion to crack a nut."

EXPORTS TO SOUTH AMERICA.—Mr. Frederic Emory, chief of the Bureau of Commerce, gives, in an article on "Our Trade with Latin-America," in *The World's Work*, the following statement of exports to South America: Barbed wire from the United States is one of our largest items of import into Argentina, and we have all the market in this line in certain sections of Brazil. Our sugar-mills and saw-mills are also winning the trade in Brazil, and our hardware, as well as our plows and reapers, are popular. The largest items of our exports of manufactures to Argentina consist of agricultural machinery and implements, railway and electric material; our motor cars are being introduced. In Chili also our trade in railway supplies is reported to be promising. In Colombia our coffee and sugar machinery, our hoes and machetes are preferred to all others, and our glassware and hardware, as well as our beer and wines, are popular. To Peru we are sending agricultural and mining machinery, clocks and watches, electrical apparatus, nails, bolts and screws, typewriters, bicycles, cotton goods. In Ecuador our axes, shoes, butter, brooms, bedsteads, canvas, clocks, perfumery, cutlery, stationery, hardware, firearms, scientific instruments, locks and canned goods compete well with those exported by other countries.

COAL EXPORTATIONS from the United States during the fiscal year just ended, as shown by the Treasury Bureau of Statistics, amounted to $22,317,496, against $19,502,813 in the fiscal year 1900, $13,661,028 in 1899, $11,008,643 in 1897, $10,646,062 in 1896, and $8,391,026 in 1891. Thus the value of coal exportations from the United States has doubled since 1897, and nearly trebled in the decade. These figures relate to values. Measured by quantity the increase has been even greater, the exports in 1901 being 7,676,149 tons, against 2,399,039 tons in 1891, thus making the total exports of 1901 in quantity more than three times as much as in 1891. The Unted States now stands third in the list of coal exporting countries of the world, coming after England and Belgium. The coal export figures of the principal countries of the world in 1899 show that while Belgium slightly exceeded the United States in the total number of tons exported, her imports were more than one-half as great as her exports, making her net exportation of coal much less than that of the United States.

OHIO DEVELOPMENT.—Mr. J. L. White, of the White Improvement Company, of Newcomerstown, Ohio, reports that he has closed successfully the negotiation of capital for the Uhrichsville, White City & Newcomerstown Electric Railway. Mr. George M. Beerbower, C. E., who recently completed the plotting of White City, has been recalled from New York City to begin the work of making the final survey and profile of the electric line between the two cities. It is expected that this necessary work can be completed in time to have considerable of the construction work on the road done before winter sets in. In addition to this, during Mr. White's sojourn in the East, he also negotiated for the location at White City of another large manufacturing plant, employing 250 hands, on a plot of 20 acres adjoining the works of the Dithridge Steel Car Company and the White Locomotive Works.

POWER IN MEXICO.—Mr. John W. McKay, secretary of the North American Beef Company, of Chicago, and James H. Davidson, a lawyer of Chicago, are in Mexico investigating the recent purchase of the packing concessions at Uruapan, State of Michoacan, which is well located for the business, as it is contiguous to the States of Jalisco, Guerrero and Oaxaca, the largest cattle States in Mexico with the possible exception of Cupatizo Falls. Mr. McKay says that the company expects to start operations with 50,000 cattle a year, and to put in a water-power plant of 8000 horse-power at Cupatizo Falls.

LARGE TELEPHONE CONTRACT.—Mr. P. C. Burns, president of the American Electric Telephone Company, of Chicago, who is now in New York City, announces that he has just closed one of the most important telephone exchange contracts ever taken. The Keystone Telephone Company, of Philadelphia, the "independent" concern which Mr. Wilson and friends have been organizing so actively, putting in subway conduits, etc., has just given Mr. Burns the order for a complete modern exchange equipment of no fewer than 8000 numbers. The work of construction and installation is to begin as soon as possible.

SALES OF TELEPHONE APPARATUS.—The Haines & Noyes Telephone Company, Chicago, reports a growing business. Among the contracts it has recently closed for exchanges may be mentioned Elma, N. Y., and two other towns in the vicinity of Buffalo, which it will equip some time in September. It has also closed the contract for equipping complete a 20-mile telephone line in Las Cruces, N. Mex., for the M. & M. Mining Company.

WESTINGHOUSE ELECTRIC MANUFACTURING COMPANY has just concluded a purchase of pig iron, for which it paid $177,000, the largest purchase ever made by the concern. The iron was of the grade known as foundry iron, and was taken at $14.75 per ton.

BALL ENGINE ORDERS SOUTH.—The Roanoke Railway & Electric Company, Roanoke, Va., recently installed a 300-hp Ball engine, built by the Ball Engine Company, Erie, Pa., and the Merchants' Cold Storage & Ice Company, Richmond, Va., has recently purchased a 70-hp Ball engine for electric service.

WESTON ELECTRICAL INSTRUMENT COMPANY has ordered a batch of about 25 plain and universal milling machines from the Cincinnati Milling Machine Company, for its new factory at Waverly, N. J.

ELECTROLYTIC COPPER.—The Orford Copper Company is to have a large electrolytic copper plant, with a capacity of about 1000 tons per month, at its Constable Hook, N. J., smelter. Considerable appartus will be needed.

General News.

THE TELEPHONE.

FORT SMITH, ARK.—Mr. John N. Eberhart, of Charleston, has just completed a line for the Franklin County Telephone Company, which embraces the following route: From Charleston to Vesta; thence to Dahoma, Peter Pender, Sub Rosa, Cecil, Meg, Webb City, Ozark and back to Charleston. The line is a strictly local affair, and has been put up by the people who live along its route.

MODESTO, CALIF.—The Sunset Telephone Company is running its lines through the Valley along the Santa Fe right of way.

SAN FRANCISCO, CALIF.—The Sunset Telephone Company, of San Francisco, has bought the local telephone system of the Petaluma Telephone Company of Petaluma, Cal., and the Bay Cities Power & Light Company is negotiating to buy the Petaluma electric and gas plant. If it succeeds the company will make Petaluma the center for distributing light and power to Sonoma and Marin counties, California.

ROME, GA.—The Southern Bell Telephone Company has begun work on a new telephone system. About $30,000 will be expended.

COVINGTON, GA.—A new local telephone system incorporated under the name of the Covington Telephone Company is to be established here. Work is being rapidly pushed on the new line, and it will be completed and ready for service soon.

CUL DE SAC, IDAHO.—The Inland Telephone Company is contemplating an extension of its line to Cul De Sac.

ROCKFORD, ILL.—A new telephone line is being erected between Hampshire and Burlington.

SALEM, ILL.—A telephone exchange is being put in at Sandoval, Ill., by the Salem Telephone Company.

WAUKEGAN, ILL.—The Chicago Telephone Company is stringing about 6000 feet of new cables in this city.

WOODSIDE, ILL.—L. L. Colburn is preparing to put up a telephone line to connect with the Springfield main line.

ALTON, ILL.—The Kinloch Telephone Company will begin the work of constructing its telephone system in Alton.

PEKIN, ILL.—The Home Telephone Company, of Sidney, is extending its lines. The improvements will cost about $1,000.

WEST POINT, ILL.—I. P. Kilgore has organized a telephone system to extend through the neighborhood about five miles west of this town.

STERLING, ILL.—The Whiteside-Harrison Telephone Company is going to rebuild its system in this city and throughout Whiteside County.

RUTLAND, ILL.—The capital stock of the La Salle & Marshall Telephone Company, of Rutland, has been increased from $30,000 to $100,000.

CENTRALIA, ILL.—The Central Union Telephone Company announces that a free service is to be extended to all subscribers to the towns and villages in this vicinity.

MACOMB, ILL.—The National Telephone Company (parent company) has secured for its Illinois State Company, the Kurtz National Telephone Company, a 30-year franchise with 200 five-year contracts.

OTTAWA, ILL.—At the last meeting of the Putnam County Board of Supervisors the Central Union Telephone Company was given permission to erect poles and lines on any of the roads of Putnam County.

CHICAGO, ILL.—C. G. Hellick has completed plans for a building to be erected in North Boulevard, near Wisconsin Avenue, Oak Park, for the Chicago Telephone Company, at a cost of $15,000. It will be two stories, of pressed brick.

BLOOMINGTON, ILL.—The Palmer-Darnall Electric Company, of Atlanta, has purchased the telephone lines and exchange belonging to Dr. J. H. Banks, and will consolidate it with its extensive telephone system recently incorporated.

COLLINSVILLE, ILL.—The Central Union Telephone Company has issued a new directory. It contains the numbers of 190 local telephones, and in addition the lists of subscribers at Collinsville, Highland, Alhambra, Marine, New Douglas, Saline, St. Jacob, St. Morgan and Troy.

CHICAGO, ILL.—Judge George Brown has ruled against the Chicago Telephone Company in its suit with the Northwestern Telephone Company. He ruled that the contention of the Chicago Company, which sought by injunction to preserve a monopoly of the use of all streets already occupied by the Chicago Company, could not be maintained.

CHICAGO, ILL.—The nickel-in-the-slot telephone, which has lately been placed in police stations, has been declared a failure by Inspector Max Heidelmeier, of the North Side. When an employe of the telephone company went to the Chicago Avenue police station to collect the money which should have been in the repository to pay for calls he found pieces of flattened brass.

GLEN HALL, IND.—The Odell Telephone Company has been formed; capital stock, $10,000. Directors: Samuel B. Lutz, H. G. Lutz and W. B. Foresman.

ELKHART, IND.—The Western Union Telegraph Company is placing on the south side of the opera house block a large clock, to be regulated by electricity, and surrounded by advertising cards.

ELKHART, IND.—The Central Union Telephone Company announces that it will rebuild its Elkhart system. It will put in an exchange at Vakarusa to compete with an independent plant there. The independent concerns are strong in this section.

NEW ALBANY, IND.—The annual convention of the Southern Indiana Independent Telephone Association at its recent meeting elected the following officers: President, G. A. Kienle, Huntingburg; Vice-President, C. D. Knoefler, New Albany; Secretary, E. W. Pickhardt, Huntingburg; Treasurer, T. M. Thom, Lamar.

CEDAR FALLS, IOWA.—Otto Wetstine, of Laporte City, has secured the contract for the erection of the building for the Interior Telephone Company of Grinnell.

MARIETTA, I. T.—The telephone line from Marietta, I. T., to Burneyville, I. T., has been completed. This is part of the proposed line of the Red River Company, which will run from McAlester to Ryan on the Rock Island. It is said the construction of the line is to be rushed.

NEW ORLEANS, LA.—The City Council has refused the privilege to the Cumberland Telephone Company to string its long-distance wires, now being put up to Monroe from Shreveport over the city traffic bridge. The present ten-wire cable will be replaced with a hundred-wire one at a cost of $1,000 or more.

BOSTON, MASS.—The Erie telephone system made a net gain of 788 subscribers in July. Net gain since January 1, 10,804. Total connected July 31, 152,403. Awaiting connection 2,473.

BOSTON, MASS.—The New England Telephone Company has begun its special exchange service to bankers and brokers Monday. Twenty instruments have already been installed, and the company has contracts signed for about 30 more, which are to be put in as fast as possible.

LONDONDERRY, MASS.—Recently the Melendy Brothers, of Londonderry, built a telephone line extending from the village of South Londonderry to Bondville, a distance of some eight miles, connecting on the way with many farmhouses. At South Londonderry the line connects with the Green Mountain telegraph system, extending from Manchester, Vt., through the towns of Peru, Londonderry, Weston, Grafton, to Bellows Falls. This line has recently installed telephone instruments. An annual charge of from $5 to $15 is made to subscribers. Another company has been formed, and is building a telephone line from Peru to the towns of Landgrove and Weston through Londonderry, and installing instruments for from $5 to $12 per year.

BALTIMORE, MD.—The Municipal Telephone Exchange has been put in operation in the City Hall. Twenty-one telephones are connected with it.

IONIA, MICH.—E. B. Fisher, of Grand Rapids, has asked the Common Council for a franchise for the Citizens' Telephone Company.

WASHINGTON, MICH.—The Valley Telephone Company has been given permission to erect poles on North Sidney, from Washington to Jefferson.

SPARTA, MINN.—The Mesaba Telephone Company is stringing another wire between here and Eveleth.

DULUTH, MINN.—The Hibbing-Virginia telephone system has been completed and every town on the Mesaba is now connected but Buhl and Chisholm.

GREENWOOD, MISS.—The charter of the Yazoo Valley Telegraph & Telephone Company has been approved; capital $150,000. The incorporators are Harvey Myers, F. C. Smith, C. E. Wright, W. D. Crist, A. F. Gardner and W. T. Rush.

MONTANA.—The Yellowstone Park Telegraph & Telephone Company has commenced the work of building a line south from Livingston, through the Livingston Canyon up Paradise Valley to Fridley and Chico

PLATTSMOUTH, NEB.—A new independent telephone company has been incorporated, with a capital stock of $50,000, to be known as the Home Telephone Company, and will have its headquarters at Papillion. The incorporators are J. D. Clarke, Papillion; C. F. Calhoun and J. M. Elwell, Springfield. The work of constructing exchanges at Springfield, Papillion and Gretna will begin at once.

CHARLOTTE, N. C.—The Southern Bell Telephone Company has recently completed another long distance line between Atlanta and New York by way of Charlotte. A reduction of about 40 per cent has also gone into effect from the South to all points east of Pittsburg and north of Baltimore. The time limit has been reduced from five to three minutes.

ELIZABETH, N. J.—A meeting of the stockholders of the Elizabeth Telephone Company has been called, and it is expected that a proposition will be made to them from the promoters of the Interstate Telephone Company for the consolidation of the local system with the big rival to the New York & New Jersey Telephone Company that is projected.

ALBANY, N. Y.—A certificate of reduction of the capital stock of the International Bell Telephone Company, Limited, from $750,000 to $500,000, has been filed with the Secretary of State.

ALBANY, N. Y.—The controlling interest of the Citizens' Standard Telephone Company of Kingston has passed to the American Construction & Trading Company, of Elyria, Ohio. It is proposed to improve the telephone system and to extend it.

LYONS, N. Y.—The Interocean Telephone & Telegraph Company, which was recently incorporated to oppose the Bell corporation, has been inspecting the Wayne and Lyons plants, and will absorb them both. Both towns will now have a first class long distance service.

BERLIN HEIGHTS, OHIO.—The Buckeye State Telephone Company has begun work on its plant at Berlin Heights.

BELLEFONTAINE, OHIO.—The Independent Telephone Company, of Bellefontaine, will extend its lines to Zanesville, Ohio.

CHAGRIN FALLS, OHIO.—The Central Union Telephone Company (Bell) has been defeated in a three years' fight to secure a franchise in this place.

SPRINGFIELD, OHIO.—The Home Telephone Company of Cleveland has secured a franchise to operate in this city. It is claimed a plant will be put in to cost $200,000.

DAYTON, OHIO.—The Home Telephone Company, of this city, has increased its capital stock from $100,000 to $750,000 upon application to the Secretary of State.

BARBERTON, OHIO.—The People's Telephone Company is increasing the

capacity of its lines to accommodate 800 subscribers in Barberton, 500 in Cuyahoga Falls and 5,000 in Akron.

URBANA, OHIO.—The Urbana Telephone Company has decided to install new cable at a cost of $10,000. The company has recently increased its subscriber list to 325, and the business demands the installation of much new equipment.

ASHTABULA, OHIO.—The stockholders of the Madison Telephone Company have elected officers as follows: C. DeVoel, president; C. S. Fenton, vice-president, and E. E. Howe, treasurer. Directors: the above, with L. R. Parker, E. J. Clapp and Dr. H. M. Fenton.

SPRINGFIELD, OHIO.—The Springfield Home Telephone Company, which has been competing with three other companies for a franchise for an independent exchange, has secured its grant. The company is promoted by Cleveland and Springfield people, and I. N. Dreyfus and H. M. Wolf, both of Cleveland, are president and treasurer, respectively. This ends one of the longest fights in the history of the independent telephone movement in Ohio.

HUNTINGDON, PA.—The Juniata Union Telephone Company, capital $1,000, has been incorporated.

JOHNSTOWN, PA.—The Johnstown Telephone Company is now operating an entirely new system—new underground cable, new telephones, new switchboards and new building. Nearly 1400 telephones has been connected up.

SHAMOKIN, PA.—The Shamokin Valley Telephone Company has decided to extend its telephone line to the farming village of Irish Valley this summer. The company will later extend a branch to Seven Points, thence to Augustaville, connecting on the other end at Sunbury.

COLUMBIA, S. C.—The South Carolina Long Distance Telephone Company, organized for the purpose of operating long-distance lines and securing other systems in the State, has so far secured nearly sixteen hundred subscribers in twenty-three different towns. Further extensions are to be made.

MITCHELL, S. D.—F. W. George, the superintendent of the lines of the Western Electric Company, is making arrangements for the extension of the long distance telephone line from Mitchell to Woonsocket.

SIOUX FALLS, S. D.—Work has begun on a farm telephone system in Beulah Township, Hanson County. Nineteen farm houses will be connected, and will have connection with the telephone system of Alexandria.

JACKSON, TENN.—A franchise has been granted to the Jackson Home Telephone Company. The Cumberland Bell system is already established here. The Jackson Home Telephone Company has secured a franchise here and forty-six subscribers at $1 per month rental. The company will put in an exchange at an early date.

DOVER, TENN.—The Luke T. Walker Telegraph & Telephone Company has filed articles of incorporation at Nashville. The company sets forth in its charter that it proposes to conduct a telephone business by local exchanges and long distance lines.

MEMPHIS, TENN.—The Memphis Telephone Company (independent), it is stated will erect a three-story exchange building, costing about $30,000. The first floor will be used for office purposes, the second for the use of employees, and the third for the switchboard, which will be equipped for 3600 private wires.

EDNA, TEXAS.—The Southwestern Telephone Company will open a local exchange in Edna.

SAN ANTONIO, TEX.—The Texas Construction Company is constructing the long-distance line for the Commercial Telephone Company, the latter being a corporation organized May 5 under the laws of the State of Texas, and being capitalized for $500,000. No bonds have as yet been issued. The present contract embraces a line over the Southern Pacific from San Antonio to Orange, Tex.; over the Santa Fe from Galveston to Houston and over the H. & T. C. from Houston to Dallas and Fort Worth. The contract calls for red cypress or red cedar poles, 30 feet in length, 6 inches diameter top, two circuits, one of No. 10 and one of No. 12 copper wire; all other material and workmanship to be the very best possible. There are now two gangs of men at work, and the work will be pushed as rapidly as possible. This line is designed to cover the southern and eastern part of the State of Texas and will operate as a feeder for the independent plant just completed in San Antonio, for that at Houston, Waco, and some minor points, and for those now in the course of construction by the Texas company at Austin, Tyler, Taylor Temple, Beaumont and Orange.

NORFOLK, VA.—The Long Distance Telephone Company, of Virginia, has completed the lines connecting Richmond with a big stretch of territory in Southside, Va., including the city of Petersburg.

MILWAUKEE, WIS.—The Citizens' Telephone Company will be organized with a capital stock of $1,500,000. Incorporators: Judge Pereles, Michael Carpenter, Patrick Meehan, Joseph Bach and Phillip Schmitt.

BARABOO, WIS.—William J. Bell, manager of the Baraboo Telephone Company, has secured a franchise to erect poles and string wires in Kilbourn and establish a telephone exchange. A new line between Baraboo and Kilbourn will be erected.

MILWAUKEE, WIS.—A. B. Ferdinand, president of the Northwestern Telephone & Electric Company and the Sheboygan County Telephone Company, claims the right to build a telephone line into Milwaukee without first obtaining a franchise, and Milwaukee's City Attorney upholds him in the contention.

RHINELANDER, WIS.—A stock company is being organized to build a telephone line from this city to Eagle River, Vilas County, taking in Robbins and Three Lakes. Enough stock to build the line has already been subscribed. The line will be extended to Tomahawk after it is on a firm financial basis.

MARINETTE, WIS.—Applications for telephone franchises in Marinette and Menominee have been made by former Governor Edward Scofield, of Oconto, and A. L. Hutchinson, of Weyauwega, Wis. They agree to have the systems in operation within a year, and will make them part of the independent telephone systems of Wisconsin.

RACINE, WIS.—The question of locating telephone and electric light poles where they will occasion the least inconvenience to property owners and the least expense to the corporations using, was raised in recent damage suits at Racine to fix the amount of damage. The finding of the Racine jury fixed the cost to be assessed on each pole at from $20 to $25 according to the street occupied.

MARSHFIELD, WIS.—The first step toward the consolidation of all the independent companies in Wisconsin into one circuit with long distance service has been taken. The Neillsville Company has purchased the line between Marshfield and Medford and will at once commence operations towards perfecting the line between the two places. The move will form complete connections between the cities of Marshfield, Wausau, Black River Falls and La Crosse, and will be made more complete in a few months.

ELECTRIC LIGHT AND POWER.

MONTEREY, CALIF.—The electric light company of Monterey will extend its lines to Pacific Grove and New Monterey on one side and Oak Grove on the other side of Monterey.

SANTA ROSA, CALIF.—The Merchants' Lighting Company of this city has sold its plant to the California Central Gas & Electric Company, which has a franchise to run wires through Sonoma and other counties of California.

LOS ANGELES, CALIF.—As the result of a rate war between the San Gabriel, El Reno and the East Side Lighting Company, the latter concern has been furnishing its patrons electric light currents free of cost. Notice of such action was given. The San Gabriel officials say they will not follow the example of the East Side Company, but will allow their rival a monopoly of the free service.

WASHINGTON, D. C.—Plans for an electric light and steam heating plant for the Fort Totten, N. D., Indian school have been completed at the Indian Office, and the contract will be given out shortly.

GRIFFIN, GA.—The city of Griffin has let a contract for the installation of $31,879 worth of additional machinery in its electric light plant.

AUGUSTA, GA.—The city has declared that all concerns in the future must pay for franchises. Stewart Phinizy and others had petitioned for street rights for a gas and electric light plant. This petition was granted on the above condition.

MASCOUTAH, ILL.—This city is about to make a new contract for electric street lighting. Bids are called for on Sept. 16.

SCOTTSBURG, IND.—The city authorities have taken favorable action toward installing an electric light plant, and are now prepared to receive bids.

LEWISTOWN, ILL.—County Treasurer H. F. Townsend has bought of Banker W. H. Rhodesn the Lewistown electric light plant.

KANKAKEE, ILL.—Initial steps have been taken for the transmission of power from dams in the Kankakee River to Chicago, where, it is stated, it will be utilized by some of the electrical companies for lighting, traction, etc. E. R. Beardsley, of Waldron, inventor of an improved dam system, is President of a company capitalized at $150,000, which will build seven dams between Altorf, five miles down the Kankakee from this city, at the junction of the Desplaines and Illinois Rivers. It is estimated that 15,000-horse-power will be obtained.

SOUTHAMPTON, L. I.—The Suffolk Light, Heat & Power Company, of Southampton, has been formed, with a capital stock of $25,000, the directors being P. Tillinghast and H. N. Stinert, of New York City, and B. C. Cluff, of Brooklyn.

PORTLAND, MAINE.—The Burrows Light Company has been formed; capital, $500,000. Incorporators: S. E. Young, A. M. Cole, Portland, Maine.

WESTBROOK, MAINE.—Two large machines for station No. 1 of the Westbrook Light & Power Company have arrived from the General Electric Company.

PORTLAND, MAINE.—The Smith-Sturtevant Light & Power Company, of Newport, Maine, has been incorporated, with a capital of $10,000. Incorporators: C. E. Smith, Newport, Maine; C. O. Sturtevant, Detroit, Maine.

OTTAWA BEACH, MICH.—The new electric light plant is now in operation, among its largest users being the Laullord Pautlinds magnificent new Beach Hotel. Current is also furnished to cottage owners at very reasonable rates.

HASTINGS, MICH.—The Thornapple Electric Company has a capital of $100,000, and operates an electric light and power plant by water power. It has 20 miles of aluminum and 12 of iron wire. President, A. S. Kopf, vice-president, H. A. Thornton.

GRAND RAPIDS, MICH.—The "city fathers" are seriously contemplating lighting all the public buildings, schools, engine houses, etc., from the municipal lighting plant. An appropriation of nearly $12,000 is thought necessary to carry the work to completion.

MUSKEGON, MICH.—Work on the new buildings of the Muskegon Traction & Lighting Company, which will consolidate the electric lighting plant and the street railway power house, is to be begun within two weeks and in operation in October. The new plant will cost between $75,000 and $100,000.

GRAND RAPIDS, MINN.—The municipality will own the electric light plant.

MINNEAPOLIS, MINN.—The plant and appurtenances of the Minneapolis International Electrical Company have been sold under a judgment decree. The debts for which the property was sold aggregated $148,120, and the amount realized at the sale was $400,000. C. F. Weed, of Boston, Mass., was the purchaser.

EAST GRAND FORKS, MINN.—A court has granted a temporary injunction restraining the city from issuing bonds to the extent of $15,000 for an electric light and power works system, on the grounds that the assessed valuation of the property in East Grand Forks was not sufficient to warrant the increase in the corporate indebtedness of the town.

KANSAS CITY, MO.—The Kansas City Electric Light Company's brick smokestacks will be by nearly twenty feet the tallest chimneys in the city. They will be built at the company's new plant on the east bank of the Kaw River, near the elevated railway bridge. Each will be 243 feet high and each will cost $11,000. Their interior diameter will be ten feet.

NORTH PLATTE, NEB.—The North Platte Electric Light, Heat & Power Company has been formed by J. Henry, Fred. C. Adams and Charles M. Brown.

OMAHA, NEB.—Articles of incorporation of the City Electric Light & Ice Company of Grand Island have been recorded. The company proposes to manufacture gas, electricity and ice. It has a capital stock of $200,000.

RALEIGH, N. C.—Mr. W. G. Andrews, president of the Raleigh Electric Company, informs us that, in spite of newspaper reports to the contrary, Raleigh is not raising $7,000 for electric light bonds. Nothing is known about the plan locally.

ORANGE, N. J.—A special dispatch from Orange, N. J., says: "People in the Oranges are interested in the question whether Thomas A. Edison is at the head of the National Electric Light, Heat & Power Company, which has submitted a bid to light the streets of Orange. The bid was signed by William E. Gilmore, as president. Mr. Gilmore is manager of the Edison phonograph works and is intimately associated with Mr. Edison in numerous business ventures. Mr. Edison is at Chautauqua and Mr. Gilmore left last week for a trip to Mexico. In their absence others of the Edison officials decline to talk about the matter. It is said the company has obtained options on property on which an electric lighting plant will be erected in time to take over the street lighting business should the contract be awarded to it.

SOUTHAMPTON, N. Y.—The Suffolk Light, Heat & Power Company, of Southampton, Suffolk County, has been incorporated; capital stock, $25,000.

ROSLYN, N. Y.—A certificate showing the increase in the capital stock of the Roslyn Light & Power Company, of Roslyn, Nassau County, from $50,000 to $100,000, has been filed.

ALBANY, N. Y.—A certificate of increase of the capital stock of the Consolidated Electric Company, of Greenwich, Washington County, from $50,000 to $75,000, has been filed with the Secretary of State.

CLYDE, N. Y.—The Board of Trustees has accepted the offer of the Clyde Electric & Power Company to furnish the streets of Clyde with light at $50 per lamp, the lights to be extinguished at 1 o'clock A. M.

ROCHESTER, N. Y.—Announcement is made that the contract for the construction of the new power plant of the Citizens' Light & Power Company has been awarded to A. Friederich Sons & Company, of this city. While no figures were given out as to the detailed contracts that have been awarded, it has been stated that the aggregate cost of the new plant, with its equipment, will be nearly $2,000,000.

AKRON, OHIO.—Mr. M. Spitzer is preparing plans for an electric light and power plant, 60x210 feet, ground dimensions, for the Canton-Akron Electric Railway Company, at Akron, Ohio, at a cost of $50,000.

SPRINGFIELD, OHIO.—The Springfield and Xenia branch of the Pennsylvania Railroad Company will be made into an electric road at once. The distance is about twenty miles and the road passes through Yellow Springs, famous as a summer resort. Clifton Springs is also along the route. The changing from steam to electricity is attributed to economy.

PITTSBURG, PA.—The Keystone Electric Company, of Braddock, has been formed, with a capital stock of $100,000, and will build a plant to compete with the Monongahela Light & Power Company.

PAWTUXET VALLEY, R. I.—New electric wires are to be placed upon the square poles in many of the valley villages and the trolley wires are also to be placed upon them.

DAVOS, SWITZERLAND.—The well-known Swiss health resort of Davos is said to be about to utilize electricity for all industrial and domestic purposes. An extensive generating plant will be constructed at a confluence of two mountain torrents from which the necessary water-power will be derived. The initial expenditure, it is estimated, will reach some $1,700,000.

LANCASTER, S. C.—The new cotton mill at Lancaster, S. C., is well under way. This mill is a four-story, 52,000-spindle mill, 1600 looms, and will be run by electricity.

LAWRENCEBURG, TENN.—It is said that a project is on foot for installing an electric light plant on School Creek, two miles from town.

GALLATIN, TENN.—The City Council at a recent meeting decided to issue bonds to the amount of $6,000, for the electric light and water plants.

ROSEBUD, TEX.—Judge Henderson, M. M. Kemp and others of the Cameron Water Works Company have purchased the water system at Rosebud and will also put in a good electric light system at that place. Mr. John Thomas, expert electrician, will have charge of the plant.

BEAUMONT, TEX.—The Beaumont Light, Heat & Electric Motor Power Company has been formed; capital stock $100,000. Incorporators: T. W. Shepherd, S. F. Cooper, I. D. Polk, W. W. Pope, of Beaumont; J. H. Kirby, of Houston, and M. A. Orlopp, of New York.

SALT LAKE CITY, UTAH.—A new company has just been organized, with a capitalization of $50,000, to furnish light to the city. Its incorporators promise that it shall be in operation by November 1. It is known as the Merchants' Lighting Company and has heavy Eastern backing.

McMECHEN, W. VA.—The poles for the electric light plant have arrived and the work of putting them in place will be pushed as rapidly as possible.

WINCHESTER, VA.—On account of the death of two persons by touching live wires, the city of Winchester is endeavoring to compel the Winchester Gas & Electric Light Company to renew its plant, it being alleged that the company has not complied with the terms of its contract by which new wires, new poles and a new plant were to be installed.

NORFOLK, VA.—A first mortgage loan of $100,000 has been negotiated by the Old Dominion Street Railway with the Colonial Trust Company, of Philadelphia. The mortgage covers the proposed Deep Creek extension of the Old Dominion Railway, and the bonds, which are gold bearing, with interest at the rate of 5 per cent, are extended for twenty years.

MONTESANO, WASH.—Chester H. Kiel has commenced work on the electric light system, for which he was granted a franchise last year. The plant will be run by water power obtained at the Sylvia Falls. The machinery and other materials necessary have been ordered. It is expected the plant will be ready to begin operations during the month of September next.

GRAND RAPIDS, WIS.—The Electric & Water Company, organized in 1899, has a capital of $40,000, and operates two dynamos. They are in the market now for copper wire and stepup transformers. P. L. Utley is manager.

CHEYENNE, WYO.—The Boston-Wyoming Smelter Company will put in an electric power and lighting plant at the mill. The power will also be used in lighting the town of Grand Encampment. The electric equipment of the mill will include machinery for the reduction of the copper matte to copper pig of 98 per cent. bullion.

THE ELECTRIC RAILWAY.

HUNTSVILLE, ALA.—A. L. Sweeney, who has secured the Huntsville Railway, Light & Power Company's plant for New York capitalists, has arrived in Huntsville to complete details and take charge of the plant.

ANNISTON, ALA.—A new electric railway may be built between Anniston and Montgomery. J. B. Rees, secretary of the Anniston & Montgomery road, which did not materialize, may dispose of the road's charter to J. W. Watts, president of the Montgomery Northern Railway.

OAKLAND, CALIF.—It is announced that W. G. Henshaw, who recently acquired a controlling interest in the Oakland, San Leando & Haywards Electric Railway Company, has transferred the same to the Oakland Transit Company. The Transit Company, which has been for the past five years buying and consolidating the Oakland street railway lines, and has just acquired the last independent line, is backed by the Realty Syndicate, which owns large tracts of city and suburban land.

HULL, CAN.—The Hull Electric Railway, which now operates between Ottawa and Aylmer, Que., has practically passed into the hands of the Ottawa, Northern & Western Railway Company. The basis of agreement of sale has, it is learned, been agreed upon, but before all the papers can be finally signed and delivered, legislation to overcome some provision in the charter will have to be obtained. This will be applied for at the next session of the Dominion Parliament. The consideration is said to be over $1,000,000 in cash and bonds.

MONTREAL, CAN.—The Montreal Park & Island Railway has now passed into the control of the Montreal Street Railway Company. The directors of the former road have resigned and the election of all the Montreal Street Railway directors immediately followed, Hon. L. J. Forget being elected president and Mr. James Ross vice-president. The purchase price of the Park and Island Railway is $1,100,000.

HAMILTON, ONT.—It is understood that the Everett syndicate, with Messrs. H. A. Everett, of Detroit, Mich., and W. Caryl Ely, of Buffalo, N. Y., as the chief promoters, has approached the Cataract Power Company, of Hamilton, Ont., with a view to including it in the big scheme of consolidating all the electric railways between Detroit and Toronto and between Hamilton and Niagara Falls. The probability is that negotiations will soon be begun for the acquirement of the Hamilton Power Company's numerous electric railways, there being an understanding, it is said, that this will come about sooner or later.

HARTFORD, CONN.—The Hartford & Springfield Street Railway Company has succeeded in securing a strip of land on the main street in Enfield, which was needed to straighten the road.

WATERBURY, CONN.—Judge Roraback in the Superior Court has granted permission for the extension of the Connecticut Railway & Lighting Company's trolley lines from Ansonia to Seymour, and from Waterbury to Watertown.

WATERBURY, CONN.—Judge Gager, of the Connecticut Superior Court, has issued an order that public necessity and convenience require the construction of an electric street railway from Waterbury through Prospect and Cheshire, to Mount Carmel, in the town of Hamden, where connection can be made with the New Haven trolley system. The order was granted on the petition of the Connecticut Railway & Lighting Company, and the company's intention is to link Waterbury and New Haven by trolley as soon as possible.

WILMINGTON, DEL.—The People's Railway Company has begun the work of building a railway in King Street from Sixth to Sixteenth. The company already has a line in King Street from Water to Sixth, which is operated in connection with the Sixth Street line.

GAINESVILLE, GA.—The stockholders of the Dahlonega & Gainesville Electric Railway have increased their bond issue from $600,000 to $750,000. The company has also secured Dunlap Shoals, near Gainesville, for $20,000. Five thousand horse-power is said to be available here. W. A. Carlisle is engineering the right of way.

GRANITE CITY, ILL.—A franchise has been granted to the Venice, Granite City & Madison Electric Railway Company.

SPRINGFIELD, ILL.—The stockholders of the Springfield-St. Louis Electric Railway have organized, and elected officers. The officers chosen are: President, D. H. Littel, of Buffalo, N. Y.; Vice-President, W. Gaulbert, of Louisville; General Manager, H. S. Reardon, of Springfield; Secretary, C. K. Minary, of Springfield; Treasurer, H. C. Hamilton, of Girard.

CHICAGO, ILL.—The Detroit & Chicago Traction Company, the lines of which are now rapidly being completed into Detroit, will be, when finished, the longest single electric railroad line in the world. It has already completed a section between Jackson and Ann Arbor, and is rapidly pushing the work between Ann Arbor and Detroit, by way of Plymouth. West of Jackson the

company has private rights of way through the country lying between that city, Albion, Marshall and Battle Creek, and has friendly relations with the railway company which operates between Battle Creek and Kalamazoo, and is now arranging for rights of way west of Kalamazoo and into the city of Chicago.

WABASH, IND.—The Wabash River Traction Company was formally opened for business recently. The line is seventeen miles long and connects this city with Peru.

GREENWOOD, IND.—Work on the interurban electric road from this city to Shelbyville has commenced. It is planned to have the road in operation by next Spring. The length will be 20 miles, and the estimated cost $350,000. The power-house will be erected at Sugar Creek, midway between Greenwood and Shelbyville.

INDIANAPOLIS, IND.—Officials of the Pennsylvania Railway Company have given out notice of their intention to equip the Indianapolis and Vincennes road between this city and Martinsville with electric trolley cars. The plan is to place the wires at the side of the track, so as not to interfere with the regular steam trains. The main track will be used for the trolley cars. It is estimated that the cost of fully equipping a steam railroad with the trolley system, including power-house and cars, will not exceed $7 a mile.

RICHMOND, IND.—The Eastern Indiana Traction Company, a new interurban railway company, has filed articles of incorporation with the Secretary of State. The company is capitalized at $10,000, the greater part of which is owned by Mr. Schwab. The officers and directors are: President, Peter Schwab, Hamilton, Ohio; Vice-President, Henry P. Lane, Franklin, Ohio; Secretary and Treasurer, Elias Folk, Franklin, Ohio. The announced intention is to construct an interurban road starting from Richmond to run to Portland, Ind., a distance of about fifty miles.

MANSFIELD, MASS.—In all probability this town before another year will be connected with North Attleboro and vicinity by electric railway.

LYNN, MASS.—President Poor, of the Haverhill & Southern New Hampshire Electric Railroad, has announced that the road has been sold to Wallace D. Lovell, of the Exeter and Hampton road, who is also the promoter of the network of electric roads through Rockingham County.

WACHUSETT, MASS.—The Wachusett Street Railway Company has organized by electing the following officers: President, F. S. Coolidge, Fitchburg; Vice-President, E. F. Glodgett, Leominster; Clerk and Treasurer, James A. Stiles, Gardner. These officers, with W. S. Reed and George R. Damon, of Leominster, constitute the Board of Directors. The most feasible plan considered is to build a trolley road as far as the grade will permit of running trolley cars with safety, then the line will go straight to the summit, using cable power. In fact, the line to ascend Mt. Wachusett will be very much after the plan in use to get to the top of Mt. Tom.

BATTLE CREEK, MICH.—The Michigan Inter-Urban Railway Company has been formed; capital, $100,000.

BENTON HARBOR, MICH.—The West Michigan Traction Company has been incorporated, with $1,000,000 capital. The company proposes to build an electric line from the vicinity of Benton Harbor to Dowagiac, Cassopolis, Decatur, Pawpaw and Kalamazoo, a distance of 80 miles. The incorporators are Eastern capitalists.

CHARLOTTE, MICH.—The Common Council has granted a franchise to Congressman Robert Gordon, of St. Mary's, Ohio, to construct a street railway through this city, the line extending from Battle Creek to Lansing. The entire right of way has now been secured under the terms of the franchise. The power house must be located here and the line be running within 25 months.

GRAND RAPIDS, MICH.—A new electric road is being planned to connect this city with Ada, Lowell, Ionia and Belding. The capital of $100,000 has all been subscribed and the promoters are now getting out articles of incorporation. It is understood that active work will be started at once. The officers are Thos. F. Carroll, president; Wallace Franklin, vice-president, and Joseph Kerwin, secretary and treasurer.

MACON, MO.—The St. Joseph Traction Company is making arrangements to bring the coal at Bevier to the bottom of the shaft by means of electric motor cars. Heretofore it has been done by mule power. The underground electric line will be nearly a mile in length.

WEST PLAINS, MO.—At Bakersfield, twenty-five miles south of this city, representatives from Mount Homer, Ark., West Plains and other places have met to offer inducements for the building of an electric line from West Plains into the North Arkansas mineral belt. The right of way and depot grounds in each town through which the proposed road will pass have been guaranteed.

GREENSBORO, N. C.—The new electric street railway company may extend its line to Pomona, two miles west of Greensboro.

DURHAM, N. C.—The Durham Traction Company has accepted its new power plant. Eight miles of electric railway will be completed. J. S. Carr, J. S. Manning and H. A. Fansher are a committee to manage the affairs of the company.

PORTSMOUTH, N. H.—The directors of the Portsmouth & Exeter Street Railway, which has been granted a situation in Stratham on the main highway between Portsmouth and Exeter have applied for additional locations on two cross roads leading to North Hampton.

TRENTON, N. J.—The Lackawanna & Wyoming Valley Rapid Transit Company, incorporated about a year ago, has filed papers increasing its capital stock to $6,500,000.

NEW YORK, N. Y.—Examination will be held by the Municipal Civil Service Commission on August 14 for the position of assistant engineer, second grade, for the rapid transit tunnel. The compensation will be between $900 and $1,200 a year.

JERSEY CITY, N. Y.—The Raritan Traction Company has secured a franchise from the Metuchen Borough Council. The trolley line between Perth Amboy and Metuchen will now be finished and direct communication will be established with New Brunswick.

ALBANY, N. Y.—The Amsterdam Street Railway Company has purchased two acres of land on the Mohawk turnpike at the foot of Tribe's Hill and thereon will erect a station, at which power will be generated for the operation of the electric lines in Gloversville, Johnstown and Amsterdam and for the road to this city.

LITTLE FALLS, N. Y.—The Mohawk Valley Traction Company has been incorporated to operate an electric road from Little Falls to Herkimer. The directors are Timothy Dosey, J. Judson Gilbert, Fred. G. Teall, James D. Feeter and Myron G. Dronner, of Little Falls; Henry Churchill, I. B. Nevendorf and Henry G. Munger, of Herkimer, and J. D. Smith, of New York City.

BROOKLYN, N. Y.—The Brooklyn Rapid Transit has placed orders for 12 large steam automobiles, to be used as repair wagons, for delivery by Oct. 1, at a cost of from $2,200 to $2,500 each. These are to be operated by steam generated from gasoline fuel. Two engines are to be placed in each wagon, giving them 24-horse-power and making the vehicle capable of carrying great weight.

PORT CHESTER, N. Y.—A certificate of consolidation of the Port Chester Street Railway Company and the Larchmont Horse Railway Company, forming the New York and Stamford Railway Company, has been filed with the Secretary of State. The new corporation has a capital of $500,000, and the directors are: W. H. Campbell, William Murray, Charles A. Singer and John Neilson, of Larchmont; N. H. Heft and G. S. Heft, of Bridgeport, Conn.; R. J. Welsh, of Greenwich, Conn.; W. A. Ward, of Port Chester, and W. H. Trumbull, of Salem, Mass.

WHITE PLAINS, N. Y.—The New York & Stamford Railway Company has been formed at White Plains, with a capital of $500,000, to build a through trolley line to Boston. The company represents the consolidation of the Larchmont and Port Chester electric companies which now operate trolley systems from Larchmont to Port Chester. The new company is now building a road to Greenwich, and as soon as this line is completed the road will be extended to Stamford and afterward to Boston. The Golden's Bridge Electric Company has begun work on a new line to connect Stamford with Danbury and Golden's Bridge. This will form a transcountry system with connecting lines to New York and New Haven, covering seventy-five miles.

MARTIN'S FERRY, OHIO.—The City Council has granted a franchise to the Ohio Rapid Transit Company.

ASHLAND, OHIO.—The Norwalk Council has granted a franchise to the Norwalk, Ashland & Southern Electric Railway.

HAMILTON, OHIO.—Peter Schwab, of Dayton, is promoting a new road which will extend from Hamilton to Richmond, Ind.

RAVENNA, OHIO.—Work on the extension of the Northern Ohio Traction Company has been stopped by an injunction. An effort is being made to compromise.

DAYTON, OHIO.—The Dayton & Troy Electric Railway Company has made application for a franchise over certain city streets to enable its cars to reach the center of the city.

YOUNGSTOWN, OHIO.—Application has been made to the County Commissioner for a franchise for the Star County Electric Railway Company between this city and Alliance.

AKRON, OHIO.—The Northern Ohio Traction Company is rebuilding nearly all its present city cars with heavier equipment, and 15 new city cars will be purchased for use next winter.

MARIETTA, OHIO.—A franchise granted to Daniel H. Buell by the County Commissioners, calls for an electric road from Marietta to St. Marys landing, a distance of fifteen and one-half miles.

CANTON, OHIO.—William H. Hoover, Charles H. Kolp and John C. Welty have purchased the franchise from T. L. Childs for the Canton-Akron Railway Company and have transferred their interests and rights to the company.

CLEVELAND, OHIO.—W. H. Gabriel and others of this city are interested in the Interstate & Leavenworth Railway Company, which has recently been incorporated with $500,000 to build a road from Leavenworth to Kansas City.

UPPER SANDUSKY, OHIO.—The Wyandot County Commissioners have granted a franchise to O. T. Stutz for an electric railway from Upper Sandusky through Sycamore and Melmore to Tiffin. Eastern capital is said to be interested in the road.

BUCYRUS, OHIO.—The Crawford County Commissioners have granted a franchise through the county to the Buckeye Traction Company, which proposes to build from Bucyrus to New Washington and Norwalk; also to construct a spur line to Tiro.

YOUNGSTOWN, OHIO.—It is reported that the Mahoning Valley Railway Company has purchased from the Quay-Cameron syndicate the road now in operation from New Castle to Mahonington. This would give the Youngstown road an entrance to New Castle.

COLUMBUS, OHIO.—The City Board of Equalization has raised the valuation of the Columbus Railway Company from $10,000 a mile to $21,161 per mile. This increases the total tax valuation of the company to $2,048,642 instead of $1,500,000 as it was last year.

HAMILTON, OHIO.—The Dayton & Germantown Traction Company has applied to the Butler County Commissioners for right of way through Madison Township to Heno. Construction work is to commence by March 1, 1903, and to be completed within six months.

HAMILTON, OHIO.—The promoters of the Hamilton & Lebanon Railway Company have secured an extension of one year from August 3, in which to commence construction work. Also an extension of one year in which to complete the road after work has been started.

EAST LIVERPOOL, OHIO.—A new party of Cleveland promoters are figuring on building a road from Salem to East Liverpool by way of Lisbon. The franchise over this route held by Haite & Smith, of Cleveland, has expired, because of failure to commence work.

BARNESVILLE, OHIO.—A proposition has been made to the Barnesville, Ohio, Council for a franchise to build six electric lines from Barnesville in as many different directions. The one company would thus receive practically twelve franchises and be master of the field.

CLEVELAND, OHIO.—The project of a new city cross town line to operate on Doan Street has been revived. Horace A. Wood is the promoter of the new project, and he has applied to the Council of Glenville for a franchise. If he secures this, he will apply to the City Council.

CINCINNATI, OHIO.—The Cincinnati Traction Company is planning to put its feed wires under ground so that there will be no danger of traffic being interrupted in case of a big fire. The work will practically free the city from overhead wires with the exception of the trolley wires.

PAINESVILLE, OHIO.—The Cleveland, Painesville & Eastern Railway has completed the right of way for its extension to Ashtabula, and 100 teams will commence construction work this week. No agreement has been reached with the Geneva Council, and the road will run a mile south of that place.

CANTON, OHIO.—The Stark County Commissioners have granted a franchise to the Canton-Massillon Railway Company for the extension of its line to Navarre. The road is nearly completed to that point, the company having commenced construction work without a formal grant from the county.

SPRINGFIELD, OHIO.—Harry Frey, Jr., has been granted a franchise over several city streets, giving entrance to the city for his proposed line to Clifton, Cedarville and Jamestown. He claims that construction work will start at once. The franchise of the Little Miami Traction Company was extended 45 days. The road is practically completed into Springfield.

CLEVELAND, OHIO.—O. P. McIlrath, who claims to be backed by prominent capitalists of this city, is securing right of way for a second line from this city to Chardon. It is stated that the road will follow the Pleasant Valley, which is claimed to be a shorter route to Cleveland than the one now used by the Cleveland & Eastern Railway. The road would open up new territory.

YOUNGSTOWN, OHIO.—The Stark County Electric Railway Company has applied to the Mahoning County Commissioners for a franchise to permit it to build a line across the southwestern section of the county. This indicates that the road is to be extended to Salem instead of only to Sebring, as has been announced. Construction work has been started on the western portion of the road.

SANDUSKY, OHIO.—Incorporation papers for the formation of a new electric line, known as the Sandusky, Clyde, Tiffin & Southern Railway Company, have been issued, with a capital stock of $10,000. The incorporators and directors are J. C. Parker, Ira S. Comstock, H. W. Johnson, W. W. Woodward, and George R. Butler. J. C. Parker is president, J. C. Hauser, secretary, and F. P. Zollinger, treasurer.

CINCINNATI, OHIO.—H. H. Becktel and A. Faber and others of this city, who are owners of the Louisville, Anchorage & Pewee Valley Electric Railway now building, the pioneer traction of Kentucky, are promoting a project to build a system of roads to extend from Marysville to Louisville following the Ohio River, with a network of spur lines extending to a number of prosperous towns in the Ohio Valley.

COLUMBUS, OHIO.—The Findlay & Southern Railway Company, which is headed by R. Rosenstock & Company, of Cleveland, has applied for a franchise over an independent route into the center of the city. The company has just secured franchises in Union County and through Marysville, under which the road must be in operation by July 1, 1902. Mr. Rosenstock states that work will start within 30 days.

COLUMBUS, OHIO.—The officials of the Columbus, Delaware & Northern Traction Company, who are backed by the Appleyard syndicate, of Boston, are endeavoring to effect a compromise with the Columbus, Delaware & Marion Railway Company, which is building a line over practically the same route planned for by the other company, and which up to the present time appears to have the best of the argument.

COLUMBUS, OHIO.—The Toledo, Columbus, Springfield & Cincinnati Railway Company has been incorporated by the Secretary of State, the capital stock being $100,000. The object of the company is stated to be the building of an electric line between the cities named. The incorporators are Ellis Bartholomew, William P. Hester, William T. Stephens, Samuel Chester and Claude Wyant. The headquarters of the company are at Toledo.

SANDUSKY, OHIO.—The City Council has passed new 25-year franchise ordinances for the Sandusky & Interurban Railway and the Sandusky, Norwalk & Southern Railway, which operate the city lines and which are owned by the Everett-Moore syndicate of Cleveland. The companies agree to lay new rails, to build certain extensions and to sell 6 tickets for 25 cents. Work is to be completed within 100 days and the company gave a bond of $10,000 to insure the work.

CLEVELAND, OHIO.—The Cleveland Eastern Railway Company has placed in operation two large alternating current units in its power house at Gates Mill. It is stated that the present power houses of the Cleveland & Chagrin Falls Railway, and the Chagrin Falls & Eastern Railway, which have been recently been consolidated with the Cleveland & Eastern, are to be abandoned and the entire system of 127 miles of road to be operated from one large central power house.

CLEVELAND, OHIO.—While in the east recently H. A. Everett, the trolley magnate, inspected several famous summer resorts which are operated by electric railway companies, and it is reported that next season the Everett-Moore syndicate will finance a summer resort project which will eclipse anything of the kind attempted in this section. It is stated the resort will be located on the lake shore, probably near Wickliffe, on the Shore Line of the Cleveland, Painesville & Eastern Railway.

CLEVELAND, OHIO.—The Cleveland Electric Railway Company is making some important improvements at its central power station. All of the old return tubular boilers have been torn out and fourteen 260-hp Sterling boilers are being installed. Work has been started on another large addition which completely fill the present building. Contracts have just been closed for a 1600-kw General Electric generator and a 2500-hp Cooper-Corliss cross-compound noncondensing engine. The work on the storage battery auxiliary station is being rushed.

CLEVELAND, OHIO.—The Western Ohio Railway Company, which is owned by the Pomeroy-Mandelbaum syndicate, has increased its capital stock from $1,000,000 to $2,500,000. The new issues have already been subscribed, and will enable the company to build its proposed extension from Lima to Findlay. The company is placing contracts for equipment, which will double the capacity for the present power-house. A contract has been closed for two 1500-hp Cooper-Corliss engines and Sterling boilers. The generators have not yet been contracted for. Contracts for cars and motors will be closed in the near future.

COLUMBUS, OHIO.—The Appleyard syndicate has finally closed the deal for the purchase of the Dayton, Lebanon & Cincinnati Railway, a steam road running from Dayton to Lebanon, and will change it to electricity at once. A right of way is being secured between Lebanon and Cincinnati, and this strip will be built as soon as possible, when the syndicate will have a through line from Columbus to Cincinnati. General Manager Fisher states that when this is built, through sleeping cars will be operated every night from Columbus to Cincinnati. It is also the intention of the syndicate to secure a line from Columbus to Cleveland.

CLEVELAND, OHIO.—A dozen promoters from various sections of the country have submitted propositions to local railway managers with a view to secure traffic arrangements for handling the express business of the various interurban roads in the State. It is stated that representatives of the existing express companies are among the number. It is stated that the Everett-Moore syndicate has under consideration a plan for handling the express business on all its affiliated lines and that something of the kind will be placed in operation as soon as the various roads are connected. The business of the Cleveland district is already in the hands of the Electric Package Company, which operates on all the roads entering the city.

TAMAQUA, PA.—The Tamaqua & Lansford Street Railway Company will shortly commence work on the construction of a line between Mauch Chunk and Lansford, of eight miles.

PHILADELPHIA, PA.—The Union Traction Company has neither bought nor agreed to buy the Mack Rapid Transit franchises for Philadelphia, which it was recently reported had been sold to it for $3,000,000. These statements are made on the authority of a director of the Traction Company.

PHILADELPHIA, PA.—At a meeting the stockholders and directors of the Centre & Clearfield Street Railway Company fixed the capital stock of the company at $500,000, divided into 10,000 shares. An issue of $500,000 of 5 per cent thirty-year bonds was also authorized.

BLOOMSBURG, PA.—The construction work of the Columbia-Montour Electric Railway, between Lime Ridge and Bloomsburg, has been completed, and it is expected that the road will be in running order over that section shortly. The Berwick-Lime Ridge division is nearly built, and will probably be running within a month.

PITTSBURG, PA.—It has been reported here that the Parkersburg Interurban Railway Company, of Parkersburg, W. Va., has absorbed the Parkersburg Gas, Electric Light & Street Railway Company, and the Parkersburg & Marietta Electric Railway Company. The combination has a capital of $500,000. The contract for building the line to Marietta will be let within a few days.

THE AUTOMOBILE.

NEWPORT, R. I.—A "Recognized Race Meeting" is now to be held at Newport under the approval of the Automobile Club of America on August 30, on Ocean Drive, at 2 P. M. There will be seven events, and prizes are offered by Messrs. Astor, Drexel, Belmont, Livermore, Havemeyer, Vanderbilt, etc.

ELECTRIC HOTEL BUSSES.—Two electric automobile busses are now in operation by the New Kenmore Hotel, Albany, N. Y., carrying guests to and from railway stations and docks. Each vehicle has a seating capacity of ten persons, and is capable of running 25 miles on one charge of the batteries.

AUTOMOBILE HEARSES.—Three motor carriages draped with black were used recently at the funeral of an employee of a motor company at Coventry, England. One had been made specially to convey the coffin. Great crowds watched this peculiar procession. This is the first time that automobiles have been used in England at a funeral.

NEW YORK TRANSPORTATION.—The New York Electric Vehicle Transportation Company has established sub-stations at 64 Vesey Street, 55 East Eighty-eighth Street, and 9 West 100th Street. Its main station is at Eighth Avenue and Forty-ninth Street. One of the great drawbacks of the company herctofore has been its inability to extend service at points remote from its main station, because of the lack of facilities elsewhere to charge batteries. This new departure is in line with the improvements inaugurated a few months ago.

NEW INDUSTRIAL COMPANIES.

THE STERLING ELECTRIC MOTOR COMPANY, of East Orange, N. J., has been incorporated; capital, $30,000. Incorporators: James R. Mapletoft, Frank C. Ferguson, H. N. Smith.

THE EMPIRE AUTO-REPAIR AND STORAGE COMPANY, of New York, has been incorporated; capital, $11,000. Directors: James Wood, Jr., E. J. Mahedy, of Brooklyn, and Florence Douglass, of Jersey City.

THE TELEPOST COMPANY, of New York City, has been incorporated at Albany, N. Y., with a capital of $100,000 to construct electrical plants. The directors are H. L. Sellers, R. H. Sellers and N. S. McKain, all of New York City.

THE STANDARD SIGNAL COMPANY, of Troy, N. Y., has been incorporated, with a capital of $300,000. The company proposes to manufacture and install mechanical, electrical, pneumatic or other system of interlocking block signals and safety appliances for railroads of every description. The principal

office is located in Troy. The directors are Alfred H. Renshaw and Palmer C. Rickett, of Troy; Henry Burden, Jr., of Cazenovia; John T. Cade, of Ridgefield, N. J., and Harvey N. Loomis, of New York.

LEGAL.

TELEGRAPH DECISIONS.—The latest volume of the English Ruling Cases (24) is noted by the New York *Times* as containing the leading case of Great Britain on the subject of the liability of telegraph companies for mistakes in messages. There the rule is that no action will lie by the receiver of a telegraphic message against the telegraph company for a mistake in the message delivered. In the United States the English rule is not adopted, and, it is held, almost without exception, that a telegraph company is liable to the person to whom a message is sent for negligence in the transmission or delivery of the message. The following are two interesting cases decided in this State: In one suit an operator of the defendant wrote "casks" for "sacks." The message called for 5000 sacks immediately, and, being written casks, the receivers shipped coarse salt instead of fine salt, as they would have done if the word had been sacks. The defendant was held to be liable. In another action to recover damages for the failure of the defendant to transmit a telegraphic message, it appeared that one of the plaintiffs, who was in this city, addressed to his firm in Buffalo a dispatch relative to important business, and demanded an immediate reply. The manager of the defendant sent the dispatch by a messenger to the firm, and told the messenger to wait for an answer. The messenger received an answer, which he put in his pocket and returned to the telegraph office. The answer remained in his pocket until accidentally discovered the next day. The message blank of the company contained a condition to the effect that whenever a message was sent to its office by one of its messengers the messenger was to be deemed the agent of the sender. The Fourth Appellate Division held, by Justice Adams, that the company was liable for the default or omission of the messenger, and that the rule or condition interposed as a defence was not reasonable in its character, nor in accord with good, sound public policy. Even if the condition were given the effect claimed for it, the Court said, the company was still liable, for the reason that, when the manager of the company directed the boy to obtain an answer to the message, the boy became the agent of the company, and the fact that he asked, waited for, and received the plaintiff's message constituted a waiver of the regulation by the company.

PERSONAL.

MR. FRANK J. SPRAGUE has returned to New York after a prolonged stay in London, in connection, it is understood, with traction matters.

MR. C. H. GRANT, of the Northern Pacific telegraph department, St. Paul, claims to have developed satisfactorily a new combination telegraph and telephone system.

DR. W. ESTY, of the University of Illinois, has become assistant professor in the electrical engineering department of Lehigh University. Mr. R. M. Wilson, of the department, has recently resigned.

MR. F. R. WELLES, the manager for the Western Electric Company in Paris, and one of the most ubiquitous electrical men in Europe, is now at home in this country, and is visiting New York, Chicago, etc. His family is with him.

MR. EDSON BRACE, said to have been formerly connected with the United States Patent Office, has favored the St. Louis Exposition people with a plan for a building of steel and glass for electrical and therapeutical exhibits. "The prime idea would be complete insulation from the earth." Mr. Brace also discusses the "saturation of the human body with magnetism." We trust there will be no electricity building there of this marvelous kind or any other kind.

BUFFALO PERSONALS.—Following is a list of names of recent registry at the booth of ELECTRICAL WORLD AND ENGINEER, Electricity Building, Pan-American Exposition, Buffalo; Dr. A. E. Kennelly, Philadelphia; J. C. Freeman, Mt. Pleasant, Mich.; F. P. Wood, Denver, Colo.; Luther Stieringer, Buffalo; L. A. Pollard, Boston; Frank Fowzey, Johnstown, Pa.; J. W. Van Buckirk, New York, N. Y.; Chas. Kuschman, Perth Amboy, N. J.; H. S. Darlington, LaGrange; Paul M. Krahmer, Chicago, Ill.; Samuel M. Strub, Toledo, O.; Geo. Swilzer, Watertown, N. Y.; J. Murray, Chicago, Ill.; Mr. O'Connell, Buffalo, N. Y.; Mr. Nova, Buffalo, N. Y.; Erle W. Miller, Council Bluffs, Iowa; Robert C. House, New York, N. Y.; Louis C. Smith, Philadelphia, Pa.; Geo. F. Clement, Woodbury, N. J.; G. F. Robinson, Pittsburg, Pa.; H Lucia, Chicago, Ill.; Alfred Shields, Greenville, Miss.; Sheriden C. Sell, Buffalo, N. Y.; S. Kochline, New York, N. Y.; F. W. Kroff, Lockport, N. Y.; R. M. Douglass, Jackson, Mich.; Wm. J. Kelly, Portsmouth, N. H.; E. C. Markham, Albany, N. Y.; Chas. Le Blanc, Paris, France; Mr. Bailey Whipple, Cleveland, O.; Wallace M. Probasco, New York, N. Y.; A. Serafini, Buenos Aires, Argentine; R. B. Treat, Newark, N. J.; C. E. Brenton, Indianola, Ia.; J. Haskins Smith, Chicago, Ill.; J. T. Kester, Hillsboro, Ill.; T. C. Tuegger, St. Thomas, Canada; C. A. B. Halvorson, Lynn, Mass.; Wm. D. Young, Cleveland, O.; John M. Marvin, New Haven, Conn.; Wallace Belmont, Buffalo, N. Y.; George Gilbert, Philadelphia, Pa.; G. W. Mackie, Hamilton, Ont.; G. F. Conckling, Plainfield, N. J.; J. E. Dwyer, Plainfield, N. J.; B. T. Conkling, Somerville, N. J.; Van Rensseler Lansingh, Chicago, Ill.; C. C. Spooner, Salida, Colo.; Chas. F. Fell, Buffalo, N. Y.; C. Wiler, Chicago, Ill.; L. E. Hamilton, Chicago, Ill.; B. T. McCormick, Ithaca, N. Y.; H. T. Hall, Schenectady, N. Y.; M. H. Gatchell, Lancaster, N. Y.; W. Jac. Marland, New York, N. Y.; C. R. Sturdevant, Lexington, Ky.; C. Emmelt, Lockport, N. Y.; A. G. Damke, Chicago, Ill.; H. A. Somax, Buffalo, N. Y.; M. R. Berry, Atlanta, Ga.; G. W. Johnston, Buffalo, N. Y.; W. E. Congdon, Salem, Conn.; J. K. Robinson, Iquique, Chili; Wm. D. Ray, Detroit, Mich.; B. W. Steele, Atlanta, Ga.; A. Hengstenberry, New York City; H. C. Wilson, New York, N. Y.; W. W. Sides, Corydon, Ky.; R. L. Torpy, Syracuse, N. Y.; John B. Neely, Spartansburg, Pa.; W. F. Meyers, St. Johns, N. B.

Trade Notes.

THE UNITED STATES STEEL CORPORATION, the largest concern in the world, has in use over 100 Cross oil filters in its mills. They were furnished by the Burt Manufacturing Company, of Akron, Ohio.

SEWING MACHINE MOTOR.—The Paragon Fan & Motor Company, New York, is making a compact and easily attached motor for the operation of sewing machines. These motors are made for both direct and alternating current, and are described and illustrated in Bulletin No. 65, issued by the company.

THE CITY OF QUINCY, MASS., has awarded the contract for building the bridge over the New York, New Haven & Hartford Railroad tracks at Warren Street to the National Bridge Company, 45 Broadway, New York. The structure is 182 feet long, and the contract includes the foundation work.

ENCLOSED ARC LAMPS.—Bulletins 13A and 15A, of the Manhattan General Construction Company, New York, refer, respectively to the "Manhattan" multiple alternating enclosed arc lamp, and the "Manhattan" multiple direct-current arc lamp. Different styles of both types of lamps are illustrated, and their principal points described.

WESTERN ELECTRIC GENERATORS.—The Western Electric Company in its Bulletin No. 2003 describes and illustrates its generators for 125 and 250 volts for power and lighting. The excellent illustrations bring out unusually well every detail of the machines—so much so, in fact, that the accompanying explanatory text is almost unnecessary.

SPRINGS.—The Wallace Barnes Company, Bristol, Conn., makes springs from all kinds of material, steel, brass and phosphor bronze, and any size wire, either flat or round. It has been enlarging its plant with a building 110x36 feet. This will enable it to double its tempering capacity, allowing it to make shipments more promptly than in the past.

THE HAINES & NOYES COMPANY, Chicago, has placed a number of agencies with prominent electrical houses throughout the East. It is pushing its absolutely non-packing transmitter, which contains no felt or other moisture-absorbing material. It will be glad to send a sample transmitter to any one interested. Mr. C. K. Hill, 210 Seventh Street, one of the largest wholesale electrical supply houses of Pittsburg, has just taken an agency for the company's guaranteed telephone apparatus. H. I. Sackett, of Court Street, Buffalo, has taken the agency for Buffalo.

STORAGE BATTERIES FOR ELECTRIC RAILWAYS.—Sipe & Sigler, of Cleveland, manufacturers of the Willard battery, state that the demand for batteries for power-house work is increasing at an astonishing rate. They have just completed a battery of 264 cells, 600-ampere hours capacity, for the Canton-Massillon Railway Company. This will be placed in operation as an auxiliary in a very few days. They recently closed their eighth contract for the government War Department, consisting of 60 cells of 1120-ampere-hour capacity, to be installed at Fort Adams near Newport, R. I.

SIGNALOID, a coloring and frosting liquid for incandescent electric lamps, is rapidly attaining a very wide sale. The manufacturers of this article, the Phenix Chemical Works, 203 Washington Street, Brooklyn, report orders from almost all parts of the world, and amongst their many customers they count some of the largest electrical concerns in America. It is claimed for Signaloid that it will never peel, chip nor crack, and will outlive the life of the lamp. It is said to contain no narcotic substance and the largest lamp manufacturers who do coloring say that Signaloid does not affect the person who does the coloring, and he does not become ill, as is often the case where injurious coloring is used.

FREE SCHOLARSHIPS FOR MECHANICS.—Attention has been called to the notice of the withdrawal of the free scholarship offer recently made by the American School of Correspondence. The American School of Correspondence is situated in Boston. The school is chartered by the Commonwealth of Massachusetts, and, it is understood, enjoys the respect and confidence of thousands of earnest students throughout the United States. Many of these are graduates from the leading technical schools who enroll for the purpose of taking up subjects not included in the courses at college. The instructors are all graduates of leading scientific schools, and have had valuable experience along engineering lines, a number being on the instruction staff of the great technical schools for which Boston is famous. The courses have been carefully laid out by prominent educators and engineering experts, and embrace every subject required by the up-to-date engineer and mechanic in order to have complete mastery over the theoretical details of his daily work. The school was founded to give high grade instruction to those men who have been compelled by adverse circumstances to leave school at an early age in order to earn a living. A postal card addressed to the American School of Correspondence, Boston, Mass., will procure a handsome handbook describing its methods and courses and giving letters from graduates expressing the results of their experience.

THE SCRANTON SCHOOLS.—The display of The International Correspondence Schools at the Pan-American Exposition, has just been completed. It is situated in the northeast corner of the Liberal Arts Building, where an enclosure has been erected for all educational work. The exhibit occupies what is termed 3 units; that is, three cases against the high board partition furnished by the Exhibition to the various exhibitors. The lower part of the cases contains complete sets of bound volumes, above which are arranged three cases containing about 100 cards on which are mounted samples of students' drawing plates, photographs of the different departments of the schools, and practical examples of students' instruction papers and original designs executed after studying the courses. Above the cases of drawing plates is a high screen covered with red burlap, across the top of which, in large brass letters, the title, International Correspondence Schools, Scranton, Pa., is inscribed. In the center of the screen is the framed certificate awarded by the Franklin Institute, of Philadelphia, on each side of which is a tablet describing the schools' methods and what they accomplish. The electrical outfit, drawing outfit, and blowpipe outfit form conspicuous features of the arrangement between the tablets and the top of the cases containing the cards, and small signs, or labels, over each inform the visitor that one of these outfits is furnished to each student in certain courses. The object of the display has been to illustrate the system of education rather than to advertise the schools.

Record of Electrical Patents

UNITED STATES PATENTS, ISSUED AUG. 13, 1901.

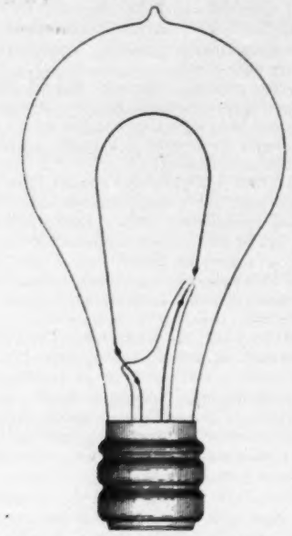
[Conducted by William A. Rosenbaum, Patent Attorney, Times Bldg., N. Y.]

680,233. ELECTRICAL COULOMB METER; Samuel E. Doane, of Marlboro, Mass. App. filed Dec. 10, 1900. (See Current News and Notes.)

680,236. REGULATION OF DYNAMO ELECTRIC MACHINES; Harold Edwards, of Schenectady, N. Y. App. filed May 17, 1901. (See Current News and Notes.)

680,242. INCANDESCENT ELECTRIC LAMP; H. Gilmore, Boston, Mass. App. filed June 14, 1899. One leg of the filament is considerably shorter than the other, to prevent vibration of the filament.

680,254. ELECTRICAL CONDUIT AND BOX; H. Krantz, Brooklyn, N. Y. App. filed May 3, 1901. The connecting necks of the box are in two parts, one formed with the body of the box, and the other a separate piece.



680,242.—Incandescent Electric Lamp.

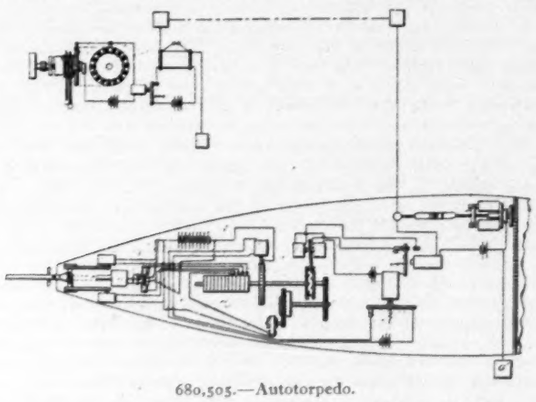
680,265. CURRENT COLLECTOR DEVICE; W. S. Moody, Schenectady, N. Y. App. filed May 22, 1901. A contact ring having an extended surface adapted to be pressed against substantially the entire periphery of the collector ring.

680,277. ELECTRICAL CONDUCTOR; E. D. Priest, Schenectady, N. Y. App. filed May 31, 1901. To prevent excessive formation of eddy currents in armature conductors, the latter is formed of parallel strips crossed at suitable intervals.

680,286. TROLLEY GUARD; C. E. Stanley, Canton, Ohio. App. filed March 20, 1901. A yoke is journaled in the forks of the trolley arm and carries guide wheels immediately above the trolley wheel.

680,316. TIMED ELECTRIC SWITCH FOR MULTIPLE RATE METER SYSTEMS; F. R. M. Cutcheon, St. Paul, Minn. App. filed March 29, 1901. Details.

680,336. ELECTRIC SWITCH; G. E. Linton, Worcester, Mass. App. filed Sept. 14, 1900. The switch blades are tubular and of insulating material for a part of their length, the tube carrying a fuse.



680,505.—Autotorpedo.

680,408. APPARATUS FOR USE IN ELECTRO-DEPOSITION OF METALS; Sherard Osborn Cowper-Coles. App. filed April 8, 1901. (See Current News and Notes.)

680,421. TRANSFORMER; F. C. Sutter, Pittsburg, Pa. App. filed May 23, 1901. The primary and secondary are divided up into sections and placed upon different parts of the magnetic circuit, the sections being connected in multiple across the mains.

680,437. TROLLEY STAND; E. J. Parker, Worcester, Mass. App. filed Jan. 31, 1901. Details.

680,440. ELECTROLYTIC APPARATUS; Brodde E. F. Rhodin, of Sault Ste. Marie, Canada. App. filed July 19, 1900. (See page 297.)

680,441. ELECTRODE FOR ELECTROLYTIC CELLS; Brodde E. F. Rhodin, of Sault Ste. Marie, Canada. App. filed July 19, 1900. (See page 297.)

680,444. SAFETY STOP FOR VEHICLES; A. L. Stevens, New York, N. Y. App. filed June 4, 1900. The safety stop is operated by the weight of the driver on the seat.

680,490. APPARATUS FOR INDICATING THE LEVEL OF CHARGES IN FURNACES; T. H. Martin, Cleveland, O. App. filed March 2, 1901. Electric terminals are distributed in the furnace, so that the material therein will affect the circuits and operate an indicator to show the level.

680,505. AUTOTORPEDO; H. Shoemaker, Philadelphia, Pa. App. filed Feb. 1, 1901. A wireless telegraph system embodying a torpedo as its receiving station to which directing signals are sent from a keyboard.

680,535. APPARATUS FOR CHARGING STORAGE BATTERIES OF AUTOMOBILE VEHICLES; J. B. Meriam, Cleveland, Ohio. App. filed Oct. 11, 1900. A circuit breaker automatically opens the circuit and at the same time cuts off the fuel supplied to the engine which drives the dynamo.

680,543. PROCESS OF PRODUCING PIPERDIN; Wilhelm Pip, of Darmstadt, Germany. App. filed Jan. 12, 1899. (See Current News and Notes.)

680,567. TROLLEY WHEEL; W. C. Cottrell, Asbury Park, N. J. App. filed Nov. 22, 1900. Details.

680,580. SOLDERING TOOL; F. Fouche, Paris, France. App. filed Sept. 15, 1900. A soldering bit is adjusted to an electric heater attached to a handle.

680,590. ELECTRICAL SIGNALING APPARATUS; Felix Benedict Herzog and Schuyler Skaats Wheeler, of New York, N. Y. App. filed Jan. 25, 1886. (See Current News and Notes.) Relates to transmitter of the teleseme.

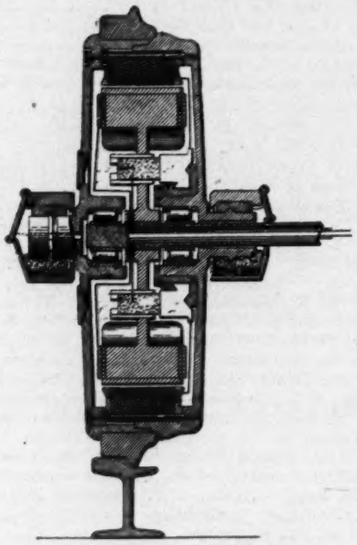
680,597. DYNAMO-ELECTRIC MACHINE AND ELECTRIC MOTOR; Henry Francis Joel, of London, England. App. filed May 21, 1901. An annular field consists of two dove-tailed sections, each section carrying two radially-projecting poles. A single continuous and sinous magnetizing coil partially embraces in succession a considerable periphery of the poles in a manner to magnetize each pair with equal and opposite polarities.

680,614. PHOTOPHONOGRAPH-PHOTOPHONE OR SIMILAR DEVICE; Joseph Poliakoff, of Charlottenburg, Germany. App. filed July 17, 1900. (See Current News and Notes.)

680,618. ELECTRIC AUTOMOBILE MOTOR; C. Richter and R. T. Eschler, Camden, N. J. App. filed Jan. 15, 1901. An electric motor is built into the wheel of the automobile.

680,619. ELECTRIC TRACTION MOTOR; C. Richter and R. T. Eschler, Camden, N. J. App. filed Jan. 15, 1901. Modification in the details of the preceding invention.

680,626. ELECTRICAL SWITCH OPERATING MECHANISM; C. B. Russell, Marlboro, Mass. App. filed May 3, 1901. Two magnets are used to act alternately upon an armature mechanically connected with the switch.



680,619.—Electric Traction Motor.

680,629. ELECTRIC BELT; J. Trussell, Chicago, Ill. App. filed Dec. 8, 1900. Details.

680,636. DEVICE FOR LIGHTING LAMPS BY ELECTRICITY; H. M. Brigham and S. M. Meyer, New York, N. Y. App. filed Feb. 5, 1898. Details.

680,662. TROLLEY STAND; E. J. Kelley, Baltimore, Md. App. filed Dec. 14, 1900. Details.

680,663. TROLLEY STAND; E. J. Kelley, Norfolk, Va. App. filed May 18, 1901. Details.